Food Manufacture

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Advanced Advertising.

ONE OF our sources of inspiration, William Springett, observes that a 2-ton statue of "Bessie Beech-Nut" has been erected near Canajoharie by the Beech-Nut Packing Company. Four others, situated on various highways entering the town, are contemplated.

We have been giving this new departure in advertising much earnest consideration, and we are inclined to go even further than Springett's suggestion, that when air travel is further advanced the statues can be stretched at full length on their backs so as to be more readily appreciated from the clouds. Our idea breaks entirely new ground, and, apart from revolutionising advertising practice, will have far-reaching consequences upon the mentality of the whole civilised world. What we suggest, and indeed advocate, is the "talking statue."

Talking Statues.

A few examples taken at random will serve to make clear our meaning. A 20-foot statue of Venus perched upon a rocky eminence might very effectively rend the mountain fastness every ten minutes with: "Hear what Doctor Grubenmann says about Schwartzenberger's black puddings. . . ." If the head were made to revolve, lighthouse fashion, the useful range would, of course, be much extended.

Care should be taken to emphasise the sustaining qualities of these puddings, since special appeal is being made to solitary mountaineers and peace-loving tourists. People of this type do not care for undue verbosity, and the main selling points should be brought out with as few words as possible. Such an appeal would make a deep impression, and it can be confidently anticipated that the message will be retained more or less permanently.

Real Salesmanship.

The unexpected is always delightfully impressive. Therefore, why not conceal in the thicket of a sunny glade, favourite resort of picnic parties, a tomb-like voice that booms forth upon festive crowds: "Two hundred and ninety-nine deaths have occurred in this locality from *Contortus Elephantitis*, one of the most deadly diseases known to man. The first symptoms are . . . Take two Fitzwilliam's pills immediately. These may be obtained from the slot machine at two shillings a box. Bent coins will be returned."

Roadside Messages.

Talking statues placed at intervals along the roadside would serve admirably to put over sales messages to passing motorists. These might take the form of reminders or warnings. Of the former one might instance: "Did you buy that bar of Sandblast Soap?" "Don't forget to take your Turbine Tonic." "Your shirt wants washing"—200 yards of silence—"the Cyclone million dollar laundry will do it for you whilst you wait." Then the scale of charges for the various items might very well be announced every 200 yards until the laundry is reached.

One could instance all kinds of warnings that might be profitably given, such as: "You will need your Keatings in the next village." "It is time you had your lunch. Stop at the Rookery Café. For the sum of three shillings you have a choice of . . ."; then follow the various items every 100 yards or so.

The same principle can be applied in an effort to popularise the towns for tourist traffic. "Wigan welcomes you"—200 yards of silence—"Wigan has the finest —— in the British Empire"—200 yards of silence—"Wigan has . . ."; and so on. Frequent announcements along the outgoing roads of "Don't forget Wigan" would complete the message.

Marbling and Corrosion.

Bogatsky and fellow-workers attribute the marble appearance of the inside of tins to the action of

organic sulphur compounds, and is independent of the character of the preserved material (*Z. Unters. Lebensm.*, 1929, 58, p. 506). The fundamental cause is light and irregular tinning; in fact, the metal may in some parts be entirely or almost entirely devoid of tin. The spots which give rise to the marble effect consist of iron sulphide, perhaps mixed with tin sulphide, showing through the thin layer of tin. Corrosion, on the other hand, is accompanied by the solution of appreciable quantities of tin, and is retarded by various other circumstances, such as the influence of the oil used in the preparations. Tinplate protected by a film of tin sulphide resists the action, in the cold, of many acid juices and of sulphur-containing organic compounds.

Wheat Glutenin.

It is generally stated that the gluten of wheat flour consists of a mixture of two proteins, named glutenin and gliadin. But there has long been an uneasy feeling that these proteins, particularly the former, might in turn be mixtures of more simple individuals, or they might be the products of alteration induced by the processes carried out in the laboratory to separate them from the parent gluten. Investigating this problem, Blish and Sandstedt show that glutenin, as prepared by the usual methods involving the use of alkali, is a product resulting from an irreversible alteration by the action of alkali on a more complex protein body. Both yield and chemical constitution of glutenin prepared by these methods will vary with the concentration of alkali; this explains the lack of concordance in analytical data. The investigators have developed a method of separation in which the use of alkali is avoided and which gives a new glutenin differing from the old glutenin in chemical constitution and physical properties. The identity of gliadin appears to be more definitely established, as there is less variation in analytical data than is the case with glutenin.

Coco-Hon-Ee.

This is the name given to a novel foodstuff now being manufactured in the Philippine Islands by the Tropic Products Company of Manila. Its name suggests kinship with coconut and honey, and, as a matter of fact, it is a factory edition of a native delicacy called "Matamis-sa-Bao" (sweet in the shell). The Filipinos make this by hand-pressing fresh coconuts and mixing the juice with native syrup. When served at fiestas or presented as a gift in bamboo tubes it is considered a special treat. The product is now put up in jars inserted in bamboo containers.

Another product, Cocolait, is made by extracting the cream from shredded coconuts by steam presses, then pasteurising it in combination with coconut water, after which it is cooled, bottled, and cold-stored. Cocolait sours after pasteurisation, in the same way as ordinary milk.

Baked Apples Canned.

Baked apples in cans is stated to be the latest idea in American canning circles. The apples are pan-baked in heavy syrup for forty-five minutes to one hour in a large revolving oven, having a capacity of 1,600 apples. They may be plain or stuffed, the latter having the core removed and then filled with raisins or a slice of lemon. Each apple is wrapped in parchment paper before it is packed in the can, which is filled with syrup, exhausted, and sterilised in the usual way. It is claimed that the novelty has met with an excellent reception, and that good results are to be expected from Alaska, tropical countries, and other places where apples are not grown.

Apples in Cartons.

Perhaps someone can tell us when the housewife will be able to buy her fruit in cartons. Apples might have as high a "presentation" value as chocolates if they were tastefully boxed instead of being slung and twirled in a paper bag. The movement for the better grading and packing of orchard products stops at the greengrocer's counter. We believe that the boxed and branded apple is no new thing in America, where they are marketed, tissue-wrapped, and trade-branded in pasteboard boxes of twelve. We are informed that some of the best British apples are sold in the States at about a shilling each.

Packed Chicken.

Canned chicken is being produced in a factory near Belfast. We are not acquainted with the details of the processing system employed, but in this connection it is interesting to turn to a description recently given of the method used since 1916 in Massachusetts for packing boneless chicken in glass containers.

The poultry are taken as required from cold storage, graded, singed, and placed on metal conveyors, one in each pocket, for examination by Government inspectors. They are then cleaned, washed, and placed in a battery of large aluminium steam-jacketed kettles and cooked in water until the meat can be readily picked from the bones. Upon removal the meat is taken from the bones, a separation into white and dark meat being made. The meat is then packed in jars, into which is poured boiling chicken jelly prepared from the bones and skins. The jars are sealed under high mechanical

vacuum by Anchor caps and afterwards placed in retorts to be processed at 240° F.

Processing Bottled Chicken.

A pressure processing system is used in order to counteract the internal pressure developed within the container. It is stated that, if sealed under 23 inches of vacuum at 70° F., the internal pressure developed at 240° F. would be 16½ lbs. (Without vacuum the pressure would be 31 lbs.) Hence, in order to keep the caps in place, the pressure in the retort must be regulated during processing to counteract the internal pressure. Actually, both pressure and temperature of the retort are automatically regulated at predetermined points.

The Chocolate Soldier.

Robert Whymper does not appear to be favourably impressed with American chocolates and their manufacturers. In an article to an American contemporary he asserts that: "Very shortly there will be no good chocolates to be had anywhere because technical chemists . . . are prostituting themselves to the quantity producers," and "it is the many chocolate manufacturers themselves, to whom I am writing, who are largely responsible for the poor, cheap rubbish so commonly found on the market to-day." He intends, unless forced into silence, to continue his tirade against any movement that threatens the industry. Evidently something has "got his goat" very badly!

The last time we saw Mr. Whymper was about two years ago—in the dining-room of a London hotel. He was quite cheerful then. What has happened since to stir his wrath? Perhaps, if this meets his eye, we shall have an explanation—typewritten, please!

A Young Canner.

What is one to say to a young man in the meat packing business, who writes as follows? "I am a young man wishing to advance myself practically and theoretically in the meat packing business. I have done some good work for my firm in the past, reducing waste and introducing new ideas that worked, and yet I cannot get the advancement that I feel I should be getting. Finding it so hard to make progress, I am writing to ask you if there are such things as qualifying examinations in connection with the preserving trade, or if there are any certificates of merit to be gained, and how to gain them.

"If you would kindly answer my queries I shall be delighted. I feel that as a younger generation we must develop our minds to make the canning industry in this country a real success."

We hope that the spirit of enterprise reflected in this admirable letter is a sign of the times. If so, then we feel optimistic about the future of British canning. We would advise him, and others of kindred spirit, to work their way patiently through the various courses given at the nearest technical school, beginning with the basic subjects, then chemistry and physics (with plenty of laboratory work), or bookkeeping and various commercial subjects or engineering subjects—depending on one's particular bent. At some centres special courses for meat traders are given, and certificates are granted by the Meat Traders' Federation. When you have learnt all you can and still remain unrecognised and unappreciated, then the only thing to do is to change over to a firm that will; sooner or later your enthusiasm and ability are bound to gain recognition.

Iodine in Fish.

The Director of the Norwegian Canning Industry's Scientific Laboratory, Dr. Gulbrand Lunde, was awarded a silver medal and diploma by the Society for Promotion of Norwegian Fisheries, at Bergen on January 21.

The honour was bestowed in recognition of Dr. Lunde's researches on the iodine content of fish. It was stated at the ceremony that Dr. Lunde has proved that Norwegian fish "contain extraordinary amounts of iodine, which is the case not only with fresh but also with canned fish. Furthermore, Dr. Lunde has demonstrated that fish food has a preventative effect against the illness *Struma* in districts where this disease occurs." The chairman called attention to the fact that these iodine researches were of great importance to the canning industry.

Dry-Ice.

Although the application of solid carbon-dioxide as a refrigerant in the ice-cream and other foodstuffs industries has not met with the same ready acceptance in this country that it has elsewhere, yet there are signs of a changing attitude. A new idea has naturally to stand up to considerable criticism and careful enquiry before it receives general recognition; first of all, one wants as much information about it as possible. Much has been written in the periodicals devoted to refrigeration, and to these reference should be made.

It is stated that the temperature of solid carbon-dioxide is 114° F. below zero, and that a 10-inch cube weighs 40 lbs., and that each pound liberates 9 cu. ft. of gas. The change from solid to gas takes place directly, without the intervention of a liquid phase. Being much heavier than air, the cold gas generated forces out and replaces the warm air of

the container or compartment, and prevents the entrance of any further warm air. In principle, "dry-ice" is made by allowing the compressed carbon-dioxide gas to expand from a nozzle through a perforated chamber lined with canvas, and the powder is compressed into the form required.

Carbon-Dioxide Preservation.

It has been frequently claimed that the gas liberated from "dry-ice" retards the growth of ordinary bacteria and improves the quality of ice-cream. In this connection it is interesting to turn to a paper presented by D. H. Killeffer before the scientific section of the Convention of American Meat Packers at Chicago on October 18, 1929. Years ago patents were taken out for preservation of foodstuffs by carbon-dioxide atmospheres. Killeffer states that many of them have proved disappointing, but that in the particular case of flesh foods really remarkable results have been obtained.

Killeffer's preliminary experiments indicated a definite preservative action of carbon-dioxide atmosphere. Probably this is due partly to the unfavourable conditions imposed on bacterial growth by the absence of oxygen and partly, perhaps mostly, to similarly unfavourable conditions being set up on the actual surface of the meat. Later experiments showed that both meat and fish would keep twice to three times as long in carbon-dioxide as in air at the same temperatures. What happens is that carbon-dioxide is absorbed by meat and fish; and the changes thus produced were followed, approximately, by the pH changes. It has, of course, been frequently demonstrated that changes in the pH value of the nutrient medium, even though relatively slight, have a profound effect on growth of many kinds of bacteria. In some of the culture plates, prepared in the course of these experiments, the change in pH value induced by carbon-dioxide was sufficient to kill the bacteria outright; in others, the bacteria were merely prevented from growing.

Application to Transport.

In applying these observations to the safe transportation of meats and fish with "dry-ice" refrigeration, the following requirements should be observed. First, the commodity should be kept at a proper temperature in transit. The effect of carbon-dioxide gas *properly applied* is to allow safe transportation for a limited period at higher temperatures than would be required without it.

Second, the commodity should be allowed to absorb as much carbon-dioxide as possible, say, by exposing it to a high concentration of gas. At least twelve hours' exposure is necessary for maximum absorption and a longer time would be advantageous.

Third, during transportation or storage as high a carbon-dioxide concentration as practicable should be maintained around the commodity to prevent the evolution of the absorbed gas. "Dry-ice" offers a practicable method of doing this. Except for a properly placed vent, the package must be gas-tight.

Fourth, as much insulation as practicable must be used to prevent undue temperature fluctuations.

It is anticipated that packaged meat and fish will be handled very largely by this method or modifications of it during next summer.

Many variables other than those mentioned have been found to affect the problem, such as humidity, physical condition of the meat, and kind of meat. These must, of course, be brought under control.

Ice-Cream Physics.

Alan Leighton, of the Bureau of Dairy Industry, Washington, in a paper entitled "Application of Physical Chemistry to Ice-Cream," which was presented last September at the Dairy Chemistry Symposium on the occasion of the Seventy-eighth Annual Meeting of the American Chemical Society (see *Industrial and Engineering Chemistry*, January, 1930), reviews the present knowledge of the physics and chemistry of ice-cream.

The methods of ice-cream manufacture have been developed largely from manufacturing experience. Some good researches have been done of a fundamental nature, but they lack co-ordination. It seems likely that further improvement of the product and more economical methods of manufacture can come about only through painstaking research of a basic character.

Our own opinion in this matter is that the present is a difficult stage, for adequate methods of expressing or describing the physical properties and the flavour of ice-cream are almost wholly lacking. One cannot precisely measure and express the effects on the finished product of varying the individual factors appertaining to the ingredients used and the processing operations employed. Until we have definitely formulated standard methods of measuring those physical properties into which the "nature" of ice-cream can be resolved, or, in other words, by means of which it can be completely described, we shall not get very far, since we lack the means of comparing one ice-cream with another and of analysing the effects of varying processing factors. Vague terms and personal estimates are not the slightest use. The first step must be one of settling questions of terminology and standardised methods of testing. Mr. Humphriss, in an article published in the present issue, raises the same point.

Unfortunately we have reached our limit, and the important conclusions reached by Mr. Leighton will have to stand over till the next issue.

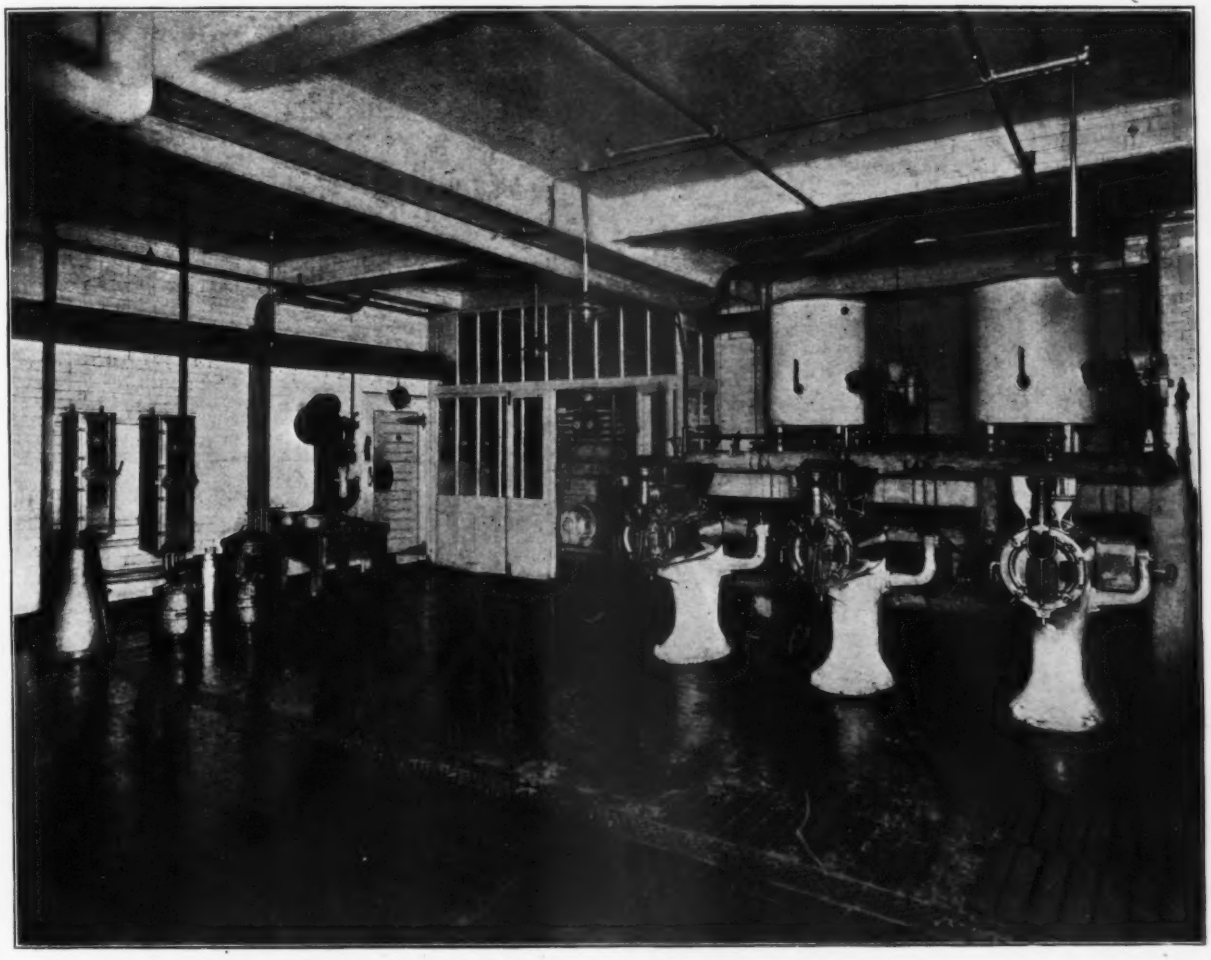
The Texture and Body of Ice-Cream

By ERIC L. E. HUMPHRISS, F.R.M.S.

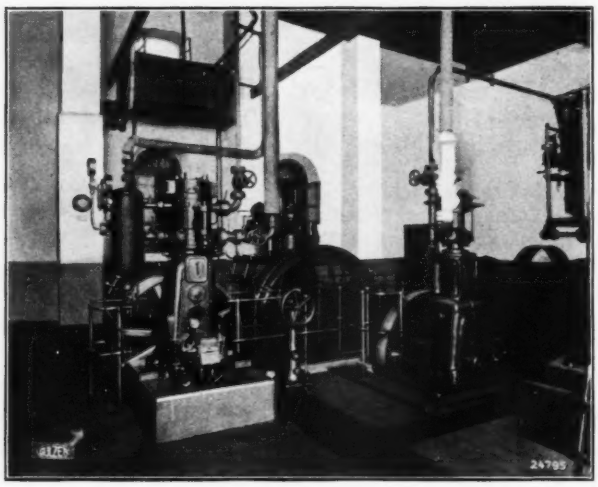
The following is a discussion of the main factors relating to the composition and processing of ice-cream which govern its texture and body. The fact that there are so many factors involved makes it imperative that each stage in manufacturing operations should be brought under strict scientific control.

THE TERM (or terms) Texture and Body as applied to ice-cream unfortunately cannot be regarded as having any specifically definable meaning, and, hence, any attempt at definition stands already condemned. In their textbook on ice-cream, Turnbow and Raffetto state that: "Texture and Body are included under one head. It is doubtful whether an accurate, clear-cut differentiation can be made between the two"; whilst Mojonnier and Troy, in their voluminous work on *Technical Dairy Control*, write: "One of the most important physical properties of ice-cream is its texture; or, in other words, its smoothness to the taste." One might therefore put the matter somewhat thus: The texture of ice-cream may be regarded as the "feel" of the product to the palate, a desirable texture being described as smooth and velvety, not coarse or grainy; whilst body may be said to refer more particularly to the "weight per unit volume" aspect of the question, and should be firm, yet not hard, and neither heavy nor light to the palate. Probably, as we examine these attributes and their governing factors more closely, their significance will become more comprehensible.

Subscribing, then, to Turnbow and Raffetto's state-



Battery of Three Freezers and Two Retarders and Ageing Vats.
(Courtesy of York Shipley, Ltd.)

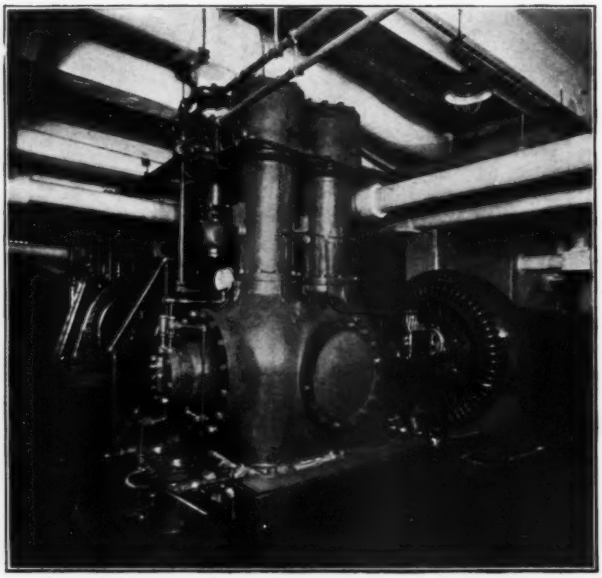


Two Ammonia Compressors.
(Courtesy of Sulzer Bros.)

ment as to impossibility of separating "Texture and Body," we will, to facilitate a logical sequence, consider the subject as a whole, and the terms as complementary to one another.

A good average standard ice-cream mix may be taken as testing somewhat as follows:

	Per Cent.
Fat	10·0
M.S.N.F.	10·5
Sucrose	13·5
Gelatin	0·5
Total Solids	34·5

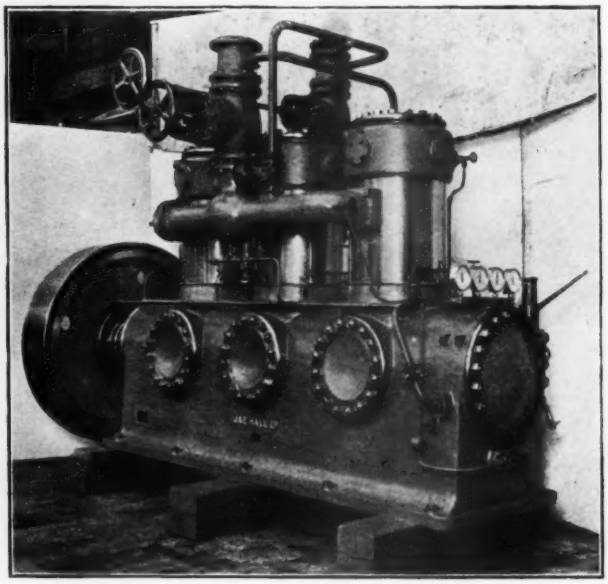


Refrigerating Machine for Ice-Cream Plant.
High-speed, Vertical, Single Acting Compressor directly connected to Motor. Forced, Automatic Feed Lubrication (left foreground).
(Courtesy of York Shipley, Ltd.)

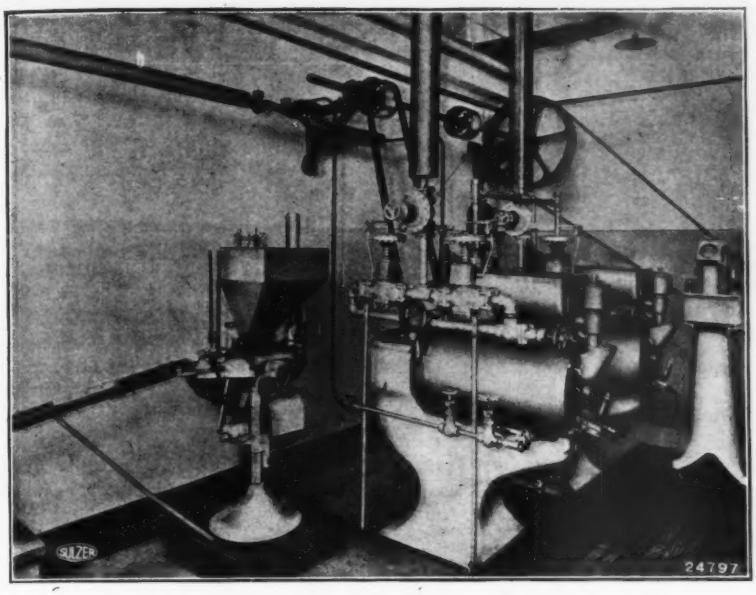
Such a mix therefore contains 65·5 per cent. water by weight, and the size of the ice crystal formed when this water is frozen very largely determines the texture of the product. The problem of obtaining and maintaining a desirable texture and body in the ice-cream therefore resolves itself very largely, though not exclusively, into a question of determining and observing the various factors affecting ice crystal magnitude. In considering this question we can with profit, I think, examine, first, the effect of the composition of the mix on the texture and body of the product, and, secondly, the effect of processing of the mix in the same two criteria.

Mix Composition.

Dealing with mix composition, then, we find that one of the first facts recognised in this direction was that any increase in the solids content of the mix tended towards a smoother texture. Each fundamental ingredient is, however, limited by entirely other considerations. Butterfat when in excess of 14·0 per cent. produces a rich, to the point of sickly rich, ice-cream, whilst sugar in excess of at the most 15·0 per cent. yields a product too sweet to be palatable. Milk solids, not fat, is limited to a maximum of 11·0 per cent.; any further addition over and above this figure results, especially on storage for any length of time, in a "sandy" product. Though pages could be written on this serious condition alone, all that concerns us here is to state that "sandiness" is the name given to the gritty feel to the tongue of ice-cream containing crystalline lactose. Lactose exists in cow's milk to the extent of 4·70 per cent. approximately, and comprises 54 per cent. of serum solids of milk, and when present in ice-cream in excess of 8·70 per cent. with respect to the water present crystallises out with disastrous results



Vertical, Enclosed, High-speed Ammonia Compressor.
(Courtesy of J. and E. Hall, Ltd.)



Ice-Cream Plant.
(Courtesy of Sulzer Bros.).

to the palatability, texture, etc., of the product. The remaining ingredient, gelatin, added as a stabiliser (protective colloid), if present sensibly in excess of 0·5 per cent., yields a product that is liable to gel during ageing, and not melt back to a liquid, the ice-cream retaining its shape and thereby creating an unfavourable impression of artificiality.

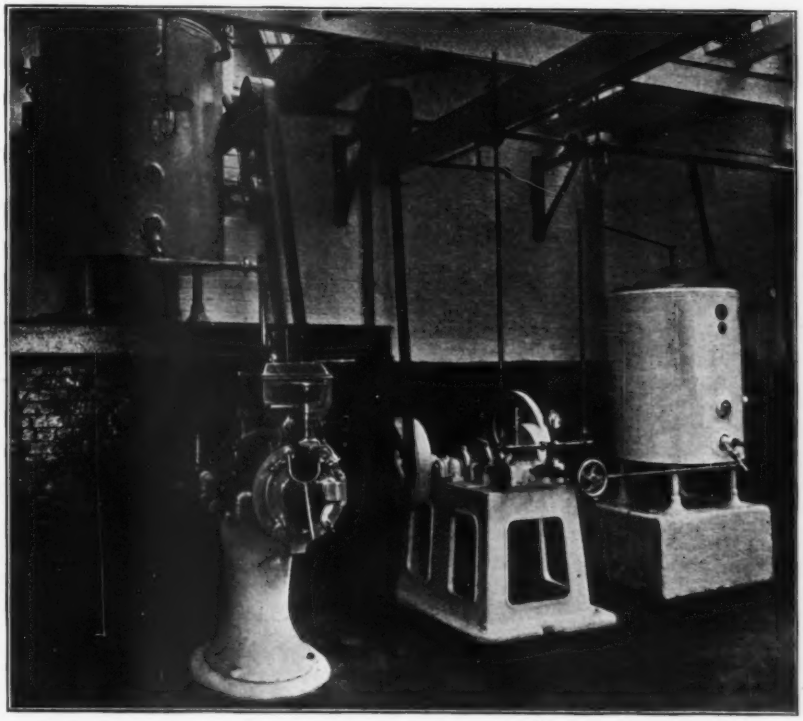
In an endeavour to augment the solids content of ice-cream, corn syrup (Cerelose) has been used. Having only a fraction of the sweetening power of sucrose, part of the "13·5 per cent. sweetening equivalent" of sucrose can be replaced by the correct (larger) amount of cerelose with a consequent enhancing of the total solids of the mix. Whilst favourable reports have been published on the use of corn sugar, N. E. Olsen in a communication to the American Trade Press as late as November last, emphatically states: "Corn sugar always yields poorer textured ice-cream and retards whipping." We cannot, therefore, regard this substance as a universally acknowledged asset in this direction, my own experience in its use experimentally being that little appreciable difference was made either way.

This same worker found likewise no advantage accruing from the use of dried egg-yolk; on the other hand, F. C. Button, writing in the *Ice-Cream Trade Journal* the same month as Olsen, reported egg-yolk ice-cream as possessing a desirable texture. The latter worker's conclusion is partially substantiated by the observations of W. H. Martin, that the texture of low solids mixes can be improved by addition of egg-yolk provided an excessive amount of overrun is not obtained.

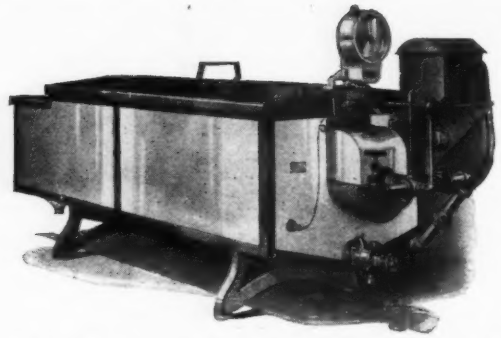
Various gums have been experimented with from time to time as possible stabilising agents in place of gelatin; however, as yet, none have been found its equal in this respect. Substances such as "cornflour" and the like can only be regarded as "fillers," and have absolutely no legitimate place in genuine ice-cream. Professor Bendixen has suggested a method whereby the correct amount of gelatin which should be added to a mix can be estimated; the application of such a method should lead to avoidance of excess or insufficiency of this important hydrophilic colloid.

Effects of Processing.

Consideration of the mechanism by which the various ingredients of the mix operate in producing a smoother textured, desirable-bodied product leads



Ice-Cream Plant for a small Installation, showing Pasteuriser, Homogeniser, Freezer, and Ageing Tanks.
(Courtesy of York Shipley, Ltd.).



C. P. Wizard Coil Pasteuriser. Sizes from 50 to 1,000 Gallons

This machine can be used as an ice-cream pasteuriser, cooler, and ageing vat, thereby eliminating other machines and simplifying the plant.

(By permission of William Storer, Ltd.)

us to the second point of our examination—namely, the effect of processing on the finished ice-cream. With the exception of pasteurising (which is a bacteriological *sine qua non*), each of the other phases of the processing can be viewed as acting especially on one or other of the mix ingredients.

Pasteurisation.

The actual pasteurisation is almost universally accomplished at 145° F. to 150° F. J. C. Fleming, of New York Agricultural Experimental Station, in some published work concludes that increased pasteurisation temperatures resulted in decreased viscosity and size of fat globule clumps, and an improvement in whipping quality. This investigator also reports the flavour, texture, and body to be not materially affected by the pasteurisation temperature until 180° F. is reached, at which temperature a cooked flavour intervenes.

Homogenisation.

After pasteurisation a very general practice both here and in the States is to cool the mix to 120° F. to 110° F. and then homogenise at approximately 2,500 lbs. per square inch, usually through a single stage homogeniser. The effect of the homogeniser is, of course, to increase the degree of dispersion of the fat—*i.e.*, break up the fat globules into smaller ones—and this results in an improved texture and an increase in the viscosity of the mix for two major reasons.

(1) Increased dispersion of the fat means increased surface area of fat, allowing, therefore, greater area for adsorption of the serum, consequently less free serum and hence increased viscosity.

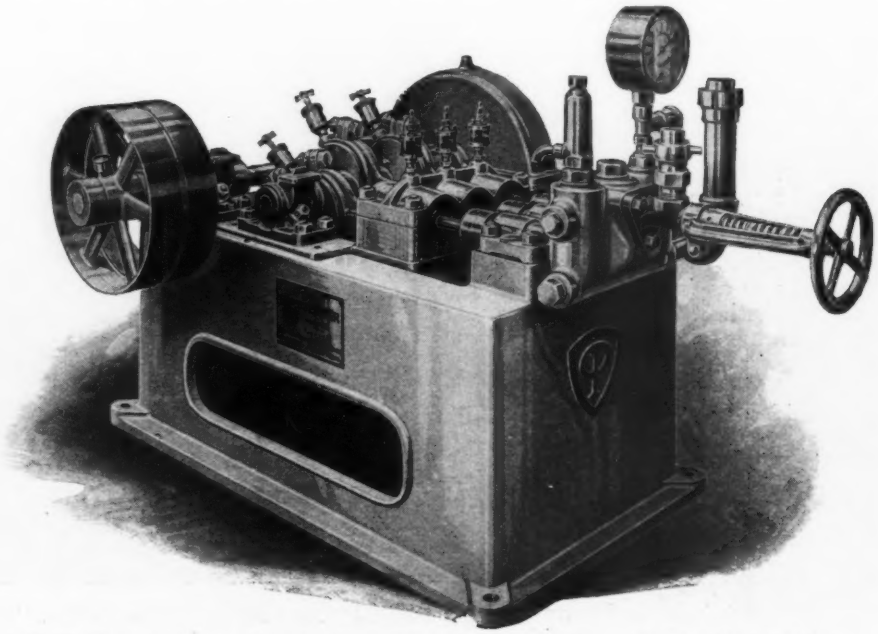
(2) After single stage homogenisation clustering of the fat globules is prone to occur, particularly if the homogenising be accomplished at temperatures near the solidification temperature of the fat. This clustering likewise causes an increase in viscosity.

Now, it has been demonstrated that increase of viscosity is more or less detrimental to whipping, and, further, the colloidal (or apparent) viscosity is rapidly destroyed in the freezer by the severe mechanical treatment meted out to the mix therein, and hence increase of colloidal viscosity is not a necessary desideratum. Double stage homogenisation breaks up the fat clusters developed after single homogenisation with a decrease in viscosity and a further improvement in texture. Likewise a homogenisation temperature in the neighbourhood of 145° F. also results in a less viscous mix and a better textured product.

Ageing.

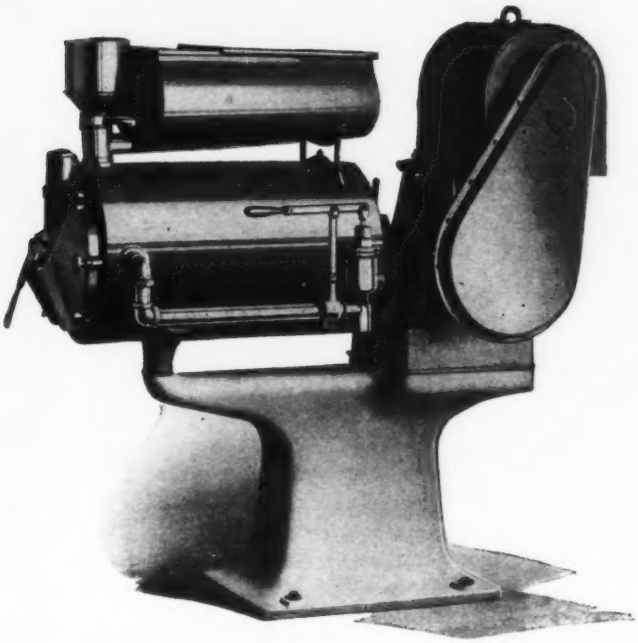
Ageing, or holding of the mix at temperatures of between 36° F. and 40° F., is very generally practised at the present time and results in an increase in apparent viscosity for which the gelatin is held largely responsible.

The general trend at the moment in this respect appears to be towards the conclusion that four hours ageing is sufficient to ensure a desirable state of the mix for freezing, the added twenty hours in the case of twenty-four hours ageing do not contribute as much as is thought to the attainment of an easily frozen mix, whilst freezing direct from the cooler yields a product definitely inferior in texture and



C. P. Homogeniser. Capacity 60 to 800 Gallons per Hour. Stellite Metal Valve.

(By permission of William Storer, Ltd.).

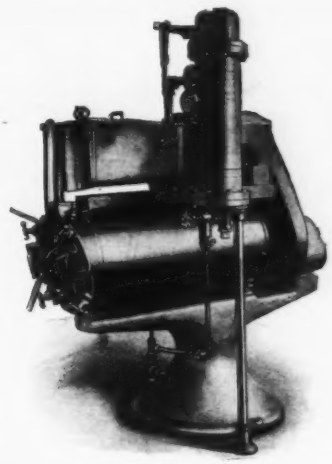


C. P. Fort Atkinson Brine Freezer. 40 and 100 Quart.
(By permission of William Storer, Ltd.).

body to one allowed to stand for four hours at a low temperature.

Freezing.

In connection with the last operation of the sequence—freezing—we cannot do better than quote Professor Turnbow at the World's Dairy Congress, England, in 1928. He there said: "The rate of freezing is a factor of major importance in controlling the texture of ice-cream." Air incorporation is of minor importance as far as texture is concerned, though, one would add, it must influence the body of the product very appreciably. On physical grounds one would postulate rapid freezing to yield a small



C. P. Progress Direct Expansion Freezer with Ammonia Control for quicker Freezing and Economy in Refrigerant. 50 and 100 Quart.
(By permission of William Storer, Ltd.).

ice crystal and certainly all the experimental evidence supports such a dictum. Professor Turnbow has, by varying the time of freezing (using carbon-dioxide), been able to get a variation of from extremely smooth to very coarse ice-cream without incorporating any air whatsoever. Quick freezing is thus very desirable in order to permit of the formation of the smallest ice crystals only, thereby ensuring a smooth-textured cream.

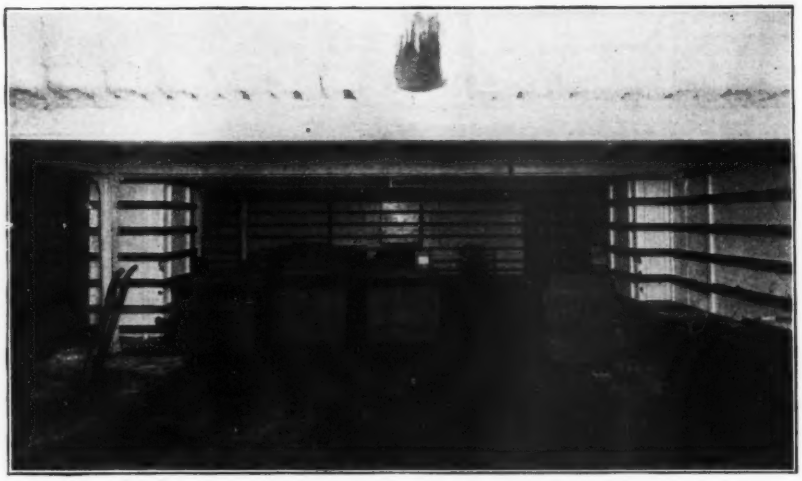
Storage.

A further point of importance in preserving a good-texture quality during storage in the hardening room, and one which is obvious from a consideration of the physical laws governing crystallisation is this. Storage of ice-cream at temperatures approaching its melting-point greatly favours crystal growth with attendant texture deterioration, and this matter has recently been gone into and experimentally proved.

Ice-Cream Hardening Rooms, showing method of Air Circulation from the Ducts to Punkah Louvres.
(Courtesy of York Shipley, Ltd.).

Conclusion.

If any inference can be legitimately drawn from a perusal of the foregoing, necessarily incomplete discussion of the very important property of ice-cream taken as a title, it is, I think, this. That all aspects and phases of the manufacture of ice-cream have a direct bearing on the Texture and Body of the ultimate product, the attaining of a desirable quality of which enjoins a constant and enlightened control over the whole process from the compounding of the mix to the serving of the frozen delicacy.



Ice-Cream Hardening Room, showing Battery to Coils.
(Courtesy of York Shipley, Ltd.).

Reducing Idle Machine Costs in the Food Factory

By FRED GROVE-PALMER, A.I.C.

THE HUM, whir, and bustle of busily working machinery attracts attention from everybody passing through the factory, but when the manager makes his round his thoughts will be occupied by the machines that are still.

There are many reasons why a certain part of the plant may be idle. It may be undergoing repairs because of a breakdown. Here is food for thought: how long will it be out of action? Does the maintenance department fully realise the need for haste because of the hourly loss of profit caused by the idle machine? Why did it break down? Was it caused by careless handling or by faulty construction? Does the man who broke it understand the cost of his carelessness? Do the makers of the machine know that it was badly made? When it has been repaired will it break down again? Is the machine so old that it ought to be scrapped? Are the directors prepared to order a modern one?

These are a few of the questions to be asked about a broken machine, and each of them wants an immediate answer if the costs of idleness are to be reduced.

The machine may be still from lack of power. If it is electrically driven by current from outside, do the suppliers know that they are hampering the output? If the supply of juice is internal, are the dynamos insufficient for the work of the factory? A steam-driven machine may be still because the boilers are overworked. Are steps being taken to increase the efficiency of the steam-raising plant? Perhaps other departments have failed to send the work along to keep the machine going. Does the system of routing the work through the factory demand a thorough overhaul and reorganisation?

The machine may not be working because the man who runs it is away. If he is ill, is he often ill and absent? Does he take time off when he thinks he will? Is he on holiday? Why is there no system of understudies by means of which an absentee can be replaced? Is the department uneconomically understaffed?

These are some of the principal reasons that will explain to the manager why part of the plant is eating up his profit, and the questions need answers if he wishes to put this undesirable state of affairs in order.

But it will often be found that the idleness is not due to any of the reasons just given, which all come directly under factory control. The cause may be lack of work, and this brings it home not to the manufacturing side but to the sales department. Consequently, the matter is referred to the Sales Manager and to those to whom he is directly responsible. It is more orders that are wanted and every effort needs to be concentrated on getting them.

The salesmen are whipped up and sent off in all directions to get more and more business to feed those idle machines. They do their best; they are always doing their best for their own sakes. They go into the highways and byways searching for new business or increased orders. Then it may be discovered that the quality of the goods is not up to the modern standard; perhaps competition can produce at lower prices; perhaps fresh lines are needed. These are possible reasons for lack of orders, and all of them call for very careful consideration from the managing director and his colleagues.

(Continued on page 93.)

The Freezing and Cold Storage of Fish

By JOHN T. CLARK, JNR.
Of Messrs. J. T. Clark and Co.

There is a keen demand for the moderate quantities of first-class frozen fish at present available. Frozen fish is a more palatable food than the bulk of the fish now gracing our coastal markets, and a really fresh fish, properly frozen and carefully looked after, is very little inferior to the finest home-produced fish that money can buy. There are indications which lead the writer of the following article to prophesy such a growth in the frozen fish business that in the short space of a few years it will have outstripped the fresh fish trade.

THE OBJECT of refrigeration in the fish trade is to absorb the surplus available in the periods of glut, and so equalise the supply and provide at all times a valuable foodstuff at a reasonable price. Many varieties of fish are migratory, and all kinds have their periods of scarcity and plenty; in other words, fish is an amazingly cheap form of food at one time and equally dear at another.

Cold in some form or other has been accepted as the nearest approach to the ideal preservative since ancient times. The first serious attempt to adopt this means of preserving fish was made in 1838, when a halibut smack of Gloucester, Mass., used blocks of ice in the hold of the vessel. The catch was packed on one side of the hold and the ice on the other, for in those days it was thought that ice had a deleterious effect on fish. The next step was the use of crushed ice between layers of fish. This method is in general use to-day, but it has several disadvantages. The appearance of the fish is impaired by continuous washing from the molten ice, the bulk of the package is increased by from 20 per cent. to 30 per cent., the cost of transit is heavy, and the actual cost of the ice is high.

Apparently the first attempt at freezing fish by artificial means was made by Enoch Piper, of Caroden, U.S.A., in about 1860. He laid the fish on racks in an insulated chamber and covered them with pans containing crushed ice and salt. From that date numerous processes have been patented.

In 1879 Sir Charles Petrie first shipped frozen salmon to this country, but owing to lack of suitable storage the venture was not a success. Again, in 1894, artificially frozen "Pacific" salmon was imported into England, and at the same time Sir Charles Petrie began importing Canadian salmon. This was the beginning of the frozen fish industry in England, which has now grown to one of considerable importance, thanks to the untiring energies of engineers, chemists, enterprising traders, etc.

Objections to Frozen Fish.

Needless to say, the path of the pioneers was not smooth, many objections being raised by the less go-ahead traders and the general public. These objections were substantially the same as those raised nearly half a century previously, when fish was first packed in crushed ice. To summarise the points of the objections:

Difference of appearance when defrosted.
Lack of flavour.
Lack of firmness of the flesh.

To some extent the objections were valid under the old systems of slow freezing and inadequate storage.

At one time defrosted fish frequently had an appearance of dryness, particularly round the fins and the tail; patches of yellow oil appeared at certain points. These two factors are due to a large extent to lack of care in storage, and their appearance can be retarded for a considerable period by storage at the lowest practicable temperature, and by glazing, a process that will be mentioned later.

Lack of Flavour.—We are not as yet able to say to which of its constituents a fish owes its flavour. But it has been proved that up-to-date methods of freezing, careful glazing, and packing go a long way towards eliminating this objection, if not entirely, to such a degree as to render the objection a negligible one.

Flabbiness of Flesh.—Freezing a fish is simply a process whereby the water constituent of the fish is

turned into a hard mass. When frozen slowly at temperatures only just below the freezing point of water, the water has a tendency to separate out, and to freeze in the form of crystals, which rupture the surrounding cell membranes and enable the water, or rather the juice, on defrosting to run out. The effect of this free juice is to make the flesh of the fish sodden to the touch, and when the fish is cut up a certain amount of this juice escapes, carrying with it some of the flavouring essentials. One of the solutions of this problem was obviously to reduce the size of the crystals formed in the freezing process; this is the reason why for some years many efforts have been made to increase the speed of freezing, as the more rapidly a fish is frozen the smaller are the crystals which are formed. This reduces the bruising of the flesh caused by the formation of large crystals, and assists in maintaining the cellular formation of the fish, to the ultimate improvement of the fish on defrosting.

Freezing Processes.—It is unnecessary to deal in detail with the very many different processes that have been tried and patented in the last thirty years for the freezing of fish. Suffice to say, they cover almost every conceivable way, from subjecting the article to natural frosts to dipping into liquid air.

It is not suggested that the perfect process has arrived; but out of this chaos of practicable and impracticable schemes has been evolved a method which is the process in use in the majority of up-to-date plants; this process is known as brine freezing.

Brine Freezing.

When salt is dissolved in water the temperature at which ice is formed is lowered, and the higher the percentage of salt up to a point the lower the temperature at which ice separates. The lowest temperature is achieved with a solution containing 22·42 per cent. salt, and the temperature at which ice separates from this solution is −6·16° F.

Conductivity.—The difference in the times required to freeze a fish in air at a given temperature and to freeze a fish in brine at the same temperature is due to two factors: namely, the conductivity and the specific heat. To take these two factors separately. The conductivity of a substance is the ability to conduct heat or cold from one point to another. In the artificial freezing of fish this means the speed at which heat can be taken from the fish to the point of low temperature. Air is a very poor conductor of heat. Water a much better one, being something like twenty to thirty times better than air.

Specific Heat.—This is the relation between the amount of heat required to raise equal amounts of substances through a certain range of temperature. The specific heat of water is the standard, its specific heat being taken as unity. The specific heat of air is 0·24. This means that 0·24 British Thermal Units would be required to raise one pound of air 1° F., while 1 B.T.U. would be required to raise one pound of water 1° F. or over 4 times as much. Now a pound of air occupies 11 cubic feet, whereas a pound of water is under a pint. Consequently, when a fish is immersed in cold brine the heat is very much more rapidly extracted than when it is exposed to the air at the same temperature.

Storage.

Once the fish is frozen hard we come to the question of storage; obviously frozen fish must be stored at a low temperature. Generally speaking, the lower the temperature at which fish is stored the better the condition of the fish on defrosting; but there is an economic limit to the temperature which can be profitably used, because the maintaining of very low temperatures costs money, and eventually this point is reached when the improvement of the storage of the article is not equalised by the added value of the article, and it has been found by the London Ice and Cold Storage Co., Ltd., that a temperature of 10° F. is financially practicable and satisfactory for the storage of frozen fish over comparatively long periods.

The two principal changes which take place during storage are drying and rusting.

Drying.—Drying is due to the fact that the moisture in the air is deposited in the form of frost on to pipes of the chamber; consequently, the air in the chambers of a cold store is dry, and has a tendency to extract the moisture from the fish, and with the moisture it is more than probable that certain of the aromatic flavouring substances disappear too. The result of all this is that on defrosting the fish has a dried-up appearance, and has also lost much of its flavour.

Rusting.—Rusting is the trade name applied to the appearance of red or yellow patches of oil on the surface of the fish. This is due to chemical changes in the fatty substances of the fish, in which the oxygen of the atmosphere plays a large part, and in advanced stages the spots may become varied.

Glazing.—The cure of these troubles is therefore to keep the fish from contact with the air. Various methods have been tried, such as placing the fish in sealed wrappers covered in wax, but the most satisfactory method up to date is glazing. This consists of enclosing the fish in a thin film of ice, and is done by dipping the frozen fish into cold water and allowing the water to freeze upon the fish. In the case of fish frozen in a solution of brine, a preliminary washing of the fish is necessary, as the brine remaining on the fish renders uniform glazing rather uncertain.

The Frozen Fish Trade.

The question that immediately springs to the mind of the layman is, "What frozen fish is in general use in this country?"

First and foremost we have salmon imported in enormous quantities from Newfoundland, Canada, the Pacific Coast of America, Japan, and Russia, to mention the most important sources. The salmon from the Atlantic seaboard of Newfoundland, America, and Canada most nearly resemble our own, and within the last few years immense plants of the most up-to-date type have been erected on these coasts to deal with these fish. The most important point in freezing fish is that the fish must be absolutely fresh when frozen, as obviously a stale fish cannot be made fresh by freezing, and, to ensure this, vessels equipped with the necessary plant are in use to deal with fish the moment it is caught.

(*Continued on page* 80.)

Lecithin in Industry

By R. HAROLD MORGAN, B.Sc., A.I.C.,
Manager, Messrs. A. J. Caley and Son, Ltd., Norwich.

The following article on a topic of great importance to chocolate, cocoa, and margarine manufacturers—and, no doubt, to many others—is from the pen of a chemist who has first-hand knowledge gained by actual factory experience and laboratory experiments. Readers interested in the subject of lecithin should refer to FOOD MANUFACTURE, *Vol. IV., pp.* 189 *and* 282, 1929: *also p.* 3 *January*, 1930.

ALTHOUGH OF universal occurrence, being present in almost every plant and animal cell, it is only recently that lecithin has been produced on a large commercial scale.

Chemically the substance is a "lipoid," and is distinguished from ordinary fats by the presence of a phosphoric acid radical in the molecule. In very small quantities it occurs in animal and vegetable tissues, and as far back as the nineteenth century phosphorus was recognised among the constituents of the brain.

Egg-yolk contains the largest amount of lecithin—viz., 8 to 10 per cent. It is for this reason that the lipoid obtained the name "lecithin," based on the Greek for egg-yolk.

The soya bean, containing up to 2 per cent., comes next in importance as the source of the valuable compound. Owing to the prohibitive cost of lecithin when extracted from such an expensive raw material as egg-yolk, much work has been done on extracting the substance from soya beans. Based on alcohol and benzol extractions, a process is now in commercial operation producing lecithin in large quantities at a reasonable price.

The commercial product is a dark brown paste containing about 60 per cent. lecithin, the remainder being pure soya oil with small quantities of phytosterol.

In a general way lecithin seems to act on fats as a protective colloid, and it tends to prevent the separation of fractional constituents.

When cooled, liquefied fats containing lecithin solidify to a homogeneous mass, and this effect is clearly shown in the case of cocoa butter, which normally crystallises in stages commencing from the outside.

The margarine industry absorbs a considerable amount of this lipoid, as its incorporation overcomes many of the differences between butter and its substitute—*e.g.*, it binds the water and so prevents spitting when frying: it is a normal constituent of butter, etc.

Naturally, lecithin is of great interest in the chocolate industry, whose products depend so much on the correct use of fats such as cocoa butter and those occurring in milk powder.

A considerable amount of experimental work has been and is being carried out on the use of lecithin in the manufacture of cocoa and chocolate. The author's chemical staff is busily engaged on this problem, and a consideration in a general way of a few of the results already obtained may be of interest.

Action on Chocolate.

The solidification of fats containing lecithin to a homogeneous mass naturally led to investigations on

The Action of Lecithin on Chocolate, as seen by A. G. Avent, A.I.C., Chief Chemist to A. J. Caley and Son, Ltd.

the use of the substance to retard that ever-occurring possibility—chocolate bloom. From tests on coverture made with and without lecithin, and exposed to conditions tending to produce bloom, the results show that the addition of this vegetable extract helps to retard the possibility of fat separation.

A striking feature of the action of lecithin on chocolate is that the viscosity of the latter is greatly reduced. This result immediately led to a consideration of the use of lecithin as a fat economiser, which in itself would be of considerable benefit in the bloom question.

In dealing with viscosities the falling ball method has been used for comparative purposes. The required amount of lecithin in an equal amount of cocoa butter is added to the chocolate in a melangeur, and a period of ten minutes was found sufficient in the case of the experimental batches for the full action of the lecithin to be exerted.

A study of the variation in viscosity of several chocolates after the addition of progressive amounts of lecithin shows that the maximum reduction takes place with approximately half a per cent. of lecithin.

As is well known, water increases the viscosity of chocolate to an alarming extent. From experiments with chocolate containing small percentages of added water by the incorporation of lecithin, these plastic masses can be quickly changed to emulsions of more or less normal viscosities.

Action on Cocoa.

Experimental results with cocoa and lecithin show the possibility of overcoming the formation of sediment at the bottom of the cup, as the addition of the lipoid helps to stabilise the emulsion formed when cocoa is made up for drinking purposes.

Although a comparative newcomer and still in the experimental stage, undoubtedly lecithin will prove to be of great value in the chocolate and cocoa industry. As mentioned above, its incorporation into chocolate helps to prevent bloom formation and lessens the amount of fat required. The stabilising of the cocoa emulsion if fully realised will overcome a public objection to this beverage and possibly increase its popularity.

Theory of Lecithin.

A theoretical explanation of the action of lecithin can at present be only hypothetical.

Chocolate is a plastic solid in which cacao, sugar, etc., is dispersed in the fat. Air enclosed between the particles gives rise to the high viscosity of the mass. Water also acts in a similar manner. By stoving chocolate at various stages during the manufacturing process the viscosity is lowered, presumably due to the escape of some of the enclosed air and to a drying action.

Lecithin seems to cause the fat to cling more closely to the particles somewhat in the nature of a protective colloid and air is able to escape, thus lowering the viscosity. Furthermore, as in the case of margarine, it binds the water and prevents separation. It is essentially a physical change which takes place very quickly, and no chemical change can be noted.

This article is based on the preliminary examination of a substance which will play a great part in some of our food industries, and, furthermore, its incorporation will be to the utmost advantage of the consumer, for it contains phosphorus and vitamin A and D, all of which are essential factors in human life.

The Citrus Oil Industry

BY DR. H. DRAKE-LAW

THE lemon oil market has suddenly changed for the worse without any apparent reason. The collapse certainly could not have been predicted earlier in the year, and most pressers expected that prices would become stable towards the middle of February. Many circumstances have contributed towards the present situation. The crisis is not due to local conditions in Messina, but is attributed by the Sicilians to the Stock Exchange collapse in New York and the Hatry failure in London, both of which have tended to reduce the buying powers of the consuming public for luxuries and semi-luxuries. The position is well summarised in the following extracts from three different letters we have received:

"MESSINA, *February* 5.—Lemon oil, unbroken, sponge pressed. Market firm, tendency upwards. The genuine sponge lemon oil is now very scarce indeed, and is in good demand. Local nominal price is now 7s. to 7s. 3d., but sellers ask 7s. 6d. for best quality. Shippers are quoting abroad 6s. to 6s. 3d., but this is sponge oil mixed with machine-made lemon oil."

"MESSINA, *February* 14.—The market this season has deceived everybody. We over here expected a decline in prices, but not the collapse which has occurred."

"MESSINA, *February* 17.—The big new crop of lemons has forced manufacturers of machine-made lemon oil to work day and night. The production is therefore enormous, while hand-pressed sponge oil keeps to the average quantity made every season.

"It is estimated that the production of sponge oil stands one to ten against this season's machine oil. Manufacturers are pressing very hard to sell machine oil, but the demand is very small indeed, and the price is going down every day. Sponge oil, on the other hand, follows the fall of the market to some extent, and the present position is very difficult.

"It is not profitable to make oil at the present figure, and most of the small manufacturers are shutting up their works. Genuine hand-pressed lemon oil cannot be sold at less than the present market price: at this figure there is no profit, and 95 per cent. of the lemon oil offered and exported as hand-pressed quality is a mixture of machine and sponge oils.

"We have every reason to believe that prices cannot be stabilised during production, and the market will settle at the end of March, when the pressing season is over for the year 1930. We believe that prices cannot fall much lower, and if speculation steps in on account of the attractive prices, then in all probability we shall see a rise."

Bread Slicing

By EDMUND B. BENNION, M.Sc. TECH., A.I.C.
(National Bakery School, London)

ALL BRANCHES of the food industry are developing rapidly, and these developments are not only in the direction of producing superior kinds of foods, but in presenting them to the public in such a way that they will have a very direct appeal. In this way it is hoped to stimulate the consumption of many different commodities so marketed.

Besides the stimulus given to trade by attention to the type of packet used or container employed, there is the hygienic and economic side to this question. Further attention is being paid also to the shape of container employed in order that a useful standard can be employed which will pack well and also make it possible for the consumer to abstract most of the food from it as easily as possible, and so prevent wastage.

Following on these progressive ideas, we have the slicing of bread and cake, which is now becoming of some importance in this country, and is likely to assume still greater importance.

Development of Sliced Bread.

There are some developments which have pushed ahead without seemingly having had any time to make history, but, even so, it is interesting to hold the development of these ideas.

Slicing of bread on a small scale has been carried out in this country for many years, mostly, however, for catering work. There has been a demand for sandwich loaves ready sliced, and this branch of the trade has been increasing so much so that any baker doing a good class business had to introduce a bread-slicing machine, hand operated or motor driven, on the lines of the bacon slicing machine.

For such bread an extra charge was made, and gradually there has been an extension of bread slicing for the ordinary household trade.

In America and Canada the possibilities of a large scale bread slicing campaign was seen some years ago, and a machine was put on the market with a capacity of 1,600 loaves per hour. This is attached to automatic plants, being placed between the cooling rack and bread wrapping machine.

Here it was found that it was the household trade which took up the idea of sliced bread and not the restaurant trade, which did most of its own slicing.

To-day the majority of bakers in America and Canada are slicing some of their bread.

Advantages of Slicing.

The slicing of bread is a great convenience to the housewife, since there are very few people who can cut regular, even slices of bread or cake. This is very often because bread knives are not kept sharpened; sometimes because they are made of poor steel, and so do not ever possess a good cutting edge; but very often because people do not understand how to use a knife for cutting a loaf of bread. Many people tend to push a knife instead of imparting to it a gentle sawing action, keeping the blade parallel with the board. Further, it is essential to have a knife with a blade of sufficient length that the point is always outside the loaf and not in the centre of the crumb, digging into it and producing crumbs.

With slicing, all these troubles are overcome, for slices of an even thickness are obtained, and wastage in the form of crumbs is completely eliminated. Wastage of bread in the form of dry crusts and outside pieces, which are always obtained with a loaf as it stands, are reduced to a minimum, since the whole sliced loaf is wrapped in wax paper, and so the slices can easily be abstracted without removing the whole loaf.

There is much bread wasted in many households by undue drying out whilst lying exposed to the air prior to being eaten.

Thickness of Slice.

For the successful development of slicing a standard thickness must be adopted which will appeal to all people. In America the standard is the half-inch slice, but that thickness is not likely to be popular, for it is higher than that used by the majority of the working-class people at the present time. A three-eighths slice is favoured over here, and this would, no doubt, be popular, whilst with a certain class of trade a quarter-inch slice would be still more acceptable. Most probably the medium slice would be the most economical, since it could be easily buttered without crumbling.

Package of Bread or Cake.

The slicing of cake has proved most popular in America, many tons of cake being sliced each week, thereby ensuring regular size of pieces in restaurants and coffee stalls.

As the loaf or cake comes from the machine it is necessary to have some method of keeping the pieces of cake or bread together. There are various methods employed, such as the use of cardboard trays. These are so made that a tension is produced which keeps the pieces in position after several have been withdrawn. In this way the cut pieces are kept moist. The tray containing the bread or cake is now passed to the wrapping machine, where it is sealed with wax paper.

Mould in Bread.

Suggestions have been made that slicing of bread would stimulate the development of moulds in bread. The same statement was made when bread was wrapped. In both cases, if the bread is properly made, thoroughly baked and cooled before cutting

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Trade Secrets

By A. BARBARA CALLOW, M.A., M.Sc., M.S.
Author of "Food and Health."

IN A recent number of the *Journal of the Institute of Chemistry*, there is an interesting account of a lecture which was given by Mr. T. Macara to the Birmingham Section of the Institute. Mr. Macara, who is the Director of the Confectionery and Allied Trade Research Association, spoke on the subject of "Co-operative Research in the Food Industries." He described the formation of the Research Association, its early difficulties, and the problems which have already been solved. Mr. Macara stated that he was somewhat limited in material for his lecture because of the necessity for trade secrecy. Such reticence is of course understandable considering the present state of affairs in industry, but I cannot help wondering whether such a limitation would be considered necessary in another fifty years' time. How long will trade secrets survive?

The Historical Aspect.

Trade secrecy reached its greatest height at the time when the mediæval guilds were in full swing. The system of apprenticeship started about the middle of the thirteenth century and rapidly became of great importance. The "prentice" was taken into the house of the master craftsman and there he was taught the trade. The carefully guarded trade secrets were handed down from one workman to another, and it was almost impossible for outsiders to probe these mysteries. The remarkable extent of the secrecy can be gauged from the following incident. Robert Boyle, the famous chemist, wanted to know from the German glass-blowers the secret of making convex mirrors without foil. In order to assist him in this endeavour, King Charles the Second sent an ambassador to Germany to ask for the information, but the glass-blowers refused to divulge their secret. In those days trade hedged itself in so much with its secrecy that it failed to gain much assistance from science, even in the seventeenth century when all kinds of famous scientific discoveries were being made.

The Scientific World.

In the domain of pure science, there is no secrecy. Scientific discoveries are openly published because scientists realise the enormous value of co-operation. Science could not have reached its present degree of eminence if research workers had decided to keep their results to themselves in the hope of thus deriving personal gain. It is true that certain scientific researches have been the means of making fortunes, but it is nearly always the business man who makes the money rather than the scientist. Take the case of vitamins. Huge sums are now being made by the sale of patent foods, baby foods, etc., which contain (or are said to contain) vitamins. These foods can be put on the market by people who have little or no knowledge of the subject. Anyone can read in the scientific journals about the distribution of vitamins in natural foodstuffs, their distinguishing characteristics, and so on. The knowledge that has been gained by years of patient toil is free to all the world. Let us suppose that the scientists whose work led to the discovery of vitamins had kept their discoveries secret. As everyone knows, Professor Sir Frederick Gowland Hopkins and Dr. Eijkman have done more than anyone else to establish the fact that there are definite deficiency diseases which can be prevented or cured by the accessory food factors which are now universally called vitamins. Let us suppose that these investigators had done all their research behind locked doors and refused to tell anyone their results. They could probably both have made fortunes by selling tins and bottles of stuff guaranteed to cure this, that, and the other. And their medicines, unlike most patent medicines, would probably have been highly efficacious. If this had been their plan they would have been richer, but the world would have been infinitely poorer. By publishing their results and freely giving away valuable suggestions for further research, Sir Frederick Hopkins and Dr. Eijkman have opened countless avenues of investigation to vast numbers of scientific workers. The present mass of information about vitamins could not possibly have been accumulated by two men alone. The different view-points of numbers of brilliant men have all contributed. Valuable work on the subject of vitamins has come from all kinds of different laboratories in all kinds of different countries. In order to carry on scientific work, open discussion and publication are essential.

Should Trade Secrets be Abolished?

We will suppose that in a certain area there are twelve firms which produce the same commodity. They each have their own trade secret. But it is quite possible that A knows all about B's trade secret, because it happens to be identical with his own. All the twelve firms may have almost the same methods of procedure, although none of them is aware of the fact. If their trade secrets are the same in each case, surely open discussion would benefit them all. They would meet the same difficulties and could help one another by relating their successes and failures. But suppose that A's trade secret is really quite different from B's, and that B's is different from C's, and so on. Each of the twelve firms has some separate device or procedure which is unknown to the other eleven. Now, if the twelve firms openly discuss their processes, each firm will gain eleven valuable pieces of information in exchange for one piece. Anyone in possession of all the twelve secrets could obviously improve the present method of procedure far more than anyone

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The Concept of "Colloid" and its Importance for the Food Chemist

By DR. W. CLAYTON, F.I.C.,
Chief Chemist and Bacteriologist, Messrs. Crosse and Blackwell, Ltd., London.

Part IV.—The Liquid—Liquid Interface—Emulsions

ON THE Ostwald classification of disperse systems, the solid-liquid systems are most important and the liquid-liquid systems next in importance. The physical chemistry of such systems concerns the phenomena arising at the liquid-liquid junction or interface and may be studied in bulk relation or in those systems termed emulsions—*i.e.*, where *one liquid is dispersed as drops in a continuous medium of another liquid.*

Surface Tension.

That water is in a state of tension is familiar knowledge, witness the spherical drop—*i.e.*, the condition for minimum surface area for a given volume. Surface tension is the force tending to reduce surface area, which infers that work must be done to extend such surface. In extending a liquid surface, the work done is the sum of the thermal energy supplied and the *free surface energy* necessary to extend the surface. At constant temperature this mechanical work or free surface energy per unit surface is numerically equal to the surface tension (expressed in dynes per cm.). The cause of surface tension is to be sought in the general question of the molecular theory of liquids and cannot be discussed in the present paper.

Interfacial Tension.

Closely analogous to surface tension is the interfacial tension at the boundary between two immiscible liquids. It can be shown on thermodynamical grounds that if a third substance be present which can affect the value of the interfacial tension, concentration phenomena (adsorption) appear—*i.e.*, the concentration of the added substance will be different in the main bulk of the solvent from what it is at the interfacial separating surface. Since the most stable arrangement accompanying interfaces in general is that the surface energy should be a minimum, it follows that the added substance will tend to leave the interface or to concentrate therein, as it tends to raise or to lower the potential energy of the interface respectively.

Adsorption.

The pure immiscible liquids will not form an emulsion except transiently or in very low concentration of the dispersed phase. For a stable emulsion an emulsifying agent must be present in addition to the two liquids concerned. Usually this agent is soluble in one of the liquids, but solid (powder) emulsifying agents are also common. The emulsifying agent is always adsorbed at the liquid-liquid interface and modern investigation has illuminated the manner of arrangement or orientation of the stabiliser at this interface between the globules and the continuous phase.

Emulsifying Agents.

It is obvious that for two liquids such as oil (O) and water (W) two *types* of emulsions are possible—viz., oil globules in water (O/W), and water globules in oil (W/O). Which type will result depends on the character of the emulsifying agent. A simple rule covering the usual technical emulsions is: oil-in-water emulsions are enhanced when the emulsifying agent is soluble in, or preferentially wetted by, water, and water-in-oil emulsions are enhanced when the emulsifying agent is soluble in, or preferentially wetted by, oil.

The greater number of soluble emulsifying agents form colloidal solutions in water or in oil. Typical emulsifying agents yielding the O/W type of emulsion are gelatin, albumin, egg-yolk, gum tragacanth, pectin, and sodium and potassium soaps. Thus, milk contains butterfat globules stabilised by casein and lactalbumin, and mayonnaise contains olive oil stabilised by egg-yolk. Water-in-oil emulsions are less common, but certain margarine emulsions are of this type and can be stabilised by vegetable oil stearines or by "Schou oil," an oxidised vegetable oil.

The most elementary conception of the *modus operandi* of the emulsifying agent is that it serves as an envelope around the dispersed globules, being present as an adsorbed film, preventing coalescence of the globules.

Emulsification.

Emulsification is the art of making emulsions. Certain principles deserve emphasis, not being sufficiently recognised in current technical practice. An essential to successful emulsification is that the liquid to be dispersed should be added slowly, with constant agitation, to the other liquid in bulk. The emulsifying agent is dissolved in the continuous phase. Again, for any type of machine or mixer used, there is an optimum of speed or degree of agitation for constant time of mixing. Thus the conditions for *most effective emulsification* with any given mixer will vary with the nature of the emulsion to be produced.

Stable Emulsions.

For permanent emulsions which will neither "cream" nor separate into oil and water certain factors obtain. The amount of the emulsifying agent must be adequate to "protect" the volume of liquid dispersed—*i.e.*, must be sufficient to "envelope" all the globules. A low interfacial tension between the two phases will be indicative of the tendency for adsorption of the emulsifying agent round the globules. A viscous continuous medium will assist in retarding the rise or creaming of the globules. The finer the globules the more stable should be the emulsion, and this is the basis of homogenisation by colloid mills, viscolisers, and homogenisers. The less the difference between the densities of the oil and aqueous phases the more stable will be the system. A consideration of Stokes' law of the rising of a globule through a liquid medium is the clue to the foregoing.

Characterisation of an Emulsion.

The type of an emulsion is most easily determined by the writer's test of electrical conductivity, since water-in-oil emulsions are insulators, whilst oil-in-water emulsions conduct electric current. The microscope often assists in differentiating type, especially if an oil-soluble dye (Sudan III) or a water-soluble dye (Nilblau) be added.

The degree of dispersion of an emulsion is apparent under the microscope, this giving a general idea as to the coarseness or fineness of the dispersion. For exact formulation special apparatus and technique must be employed so that a size-frequency analysis of the emulsion is determined. The percentages of globules of definite diameter-range are plotted as ordinates against diameters as abscissæ, and the curve so obtained clearly pictures the degree of dispersion attained in making the emulsion.

The concentration of an emulsion—*i.e.*, the amount of dispersed phase—is determined by "breaking" the emulsion—*e.g.*, adding an acid or alum and centrifuging. (Emulsions are described in the literature containing up to 99 per cent. oil dispersed in water and *vice versa*. Such high concentration of dispersed phase are viscous systems of blanc-mange character. Mayonnaise with 75 to 80 per cent. oil represents the usual technical limit.)

Problems of Edible Emulsions.

The food chemist is concerned with such emulsions as milk, cream, salad dressing, mayonnaise, and pharmaceutical emulsions, as well as with solidified emulsion systems such as butter, margarine, and cheese. He is confronted with the problem of stabilising emulsions—*e.g.*, salad dressings—and with separating emulsions—*e.g.*, cream from milk. The fact that emulsion globules carry an electric charge and are influenced by electrolytes must be borne in mind. He should be familiar with the various types of emulsifying machines and with the apparatus for fine dispersion or homogenisation. The only sound basis is a knowledge of the modern literature dealing with interfacial tension and with orientation and adsorption at interfaces, particularly the liquid-liquid interface.

(*Continued from page 74.*)

The Refrigerated Ship.—The most noteworthy instance of using a refrigerated vessel for dealing with a catch of fish is at the halibut fisheries off the coast of Greenland. On these grounds halibut and cod are to be taken in enormous quantities. The fish are caught by means of long lines of hooks by motor boats, and these boats are taken aboard the parent ship to the fish grounds. The catch is taken to the mother ship where the fish is cleaned and frozen at once.

The company running these vessels is supplying this country with the finest of frozen fish that is obtainable, and, in spite of the prophecies of bankruptcy, etc., that were made when the first catch was landed at Hull, this fish is in very keen demand and the price it realises at open auction is now very little behind that made by the finest of Scotch halibuts which have been caught but a few hours.

The result of considerable experience shows that a really fresh fish, properly frozen and carefully looked after, is very little inferior to the finest home produced fish that money can buy. The position is really rather similar to that occupied by "Canterbury lamb" in our national menu.

Defrosting.—With regard to defrosting, the best method is to allow a fish to thaw out in the air at ordinary temperatures; forcible methods, such as immersion in running water, etc., are distinctly harmful. The finest method of all, where practicable, is for the fish to be cooked while still hard; this ensures that the juice of the fish remains in the fish or sauce.

Nowadays when the supply of really fresh fish (that is, fish that has not been caught more than a day or two) is so inadequate and commands such a high price, the need for a substitute becomes pressing. This need can be met by fish frozen at fertile but distant grounds, or, as is at present done, by bringing the fish from these same grounds packed in ice, which means to say that a fish may easily have been dead for three weeks by the time it reaches the cook. What the cook thinks of the odour of these stale fish while the cooking is going on has not as yet been published, but it can hardly be expected to make the mouth water for more.

It appears, therefore, that there is available to the public frozen fish which is a more palatable food than the bulk of the fish at present gracing our coastal markets, and the proof that this is so is shown by the very keen demand experienced for the moderate quantities of first-class frozen fish at present obtainable.

It would perhaps not be very rash to prophesy that a few years will show the supply of the frozen article far in excess of that of the fresh, as is the state of affairs in the meat trade to-day.

MAN'S knowledge of human anatomy, the chemistry of body functions, preventive medicine, and nutrition are reaching a point where most cases of ill-health may be looked upon as evidences of carelessness or neglect on the part of the individual.

Acidity, pH and Food Manufacture

By L. E. CAMPBELL, M.Sc., Ph.D., F.I.C.,
Assistant Director, British Association of Research for the Cocoa, Chocolate, Sugar Confectionery, and Jam Trades.

In order to assist more or less non-technical readers to gain an intelligent grasp of the precise meaning of "pH" and to appreciate its importance in the various foodstuffs industries, we requested Dr. Campbell to prepare a simple, straightforward article that could be followed by those who were not M.A.s, D.Sc.s, and so on.

PART I.

THE SUBJECT of this article is becoming a somewhat hackneyed one, but the experience of the Research Association is that, with subjects such as this, a certain amount of reiteration is desirable. At the same time, different writers each stress some particular points touched on but lightly by others, so that some advantage is to be gained by reading reviews of the same subject written by different authors.

Most visitors to this Association's laboratories are interested in the pH apparatus, and of these the majority, whilst quite appreciative of the importance of the subject and of the practical results obtained by its study, appear to be mystified by the necessarily brief outline of the theory of the subject which is given to them.

It is in an article such as this that an opportunity occurs of putting forward an explanation which may be more intelligible to those who have not hitherto been in touch with the subject, and the first step will be to attempt some definition of what "pH" actually means.

The Meaning of "pH."

All the principal characteristics of acids are due to the one element which they contain in common—namely, hydrogen. But it is only hydrogen in a certain form which possesses these properties.

When an acid is dissolved in water, there occurs a certain splitting-up into two portions of opposite electrical charge. With acids, the positively charged portion always consists of hydrogen, whilst the negatively charged portion consists of the remainder of the acid group. These two portions are called "ions," and the charged hydrogen therefore consists of "hydrogen-ions." Now, as it is the "hydrogen-ions" which determine the strength of an acid, it is clear that acids are strong or weak according to the extent to which they split up or "dissociate" when dissolved in water. Sulphuric and hydrochloric acids, for example, dissociate to a much greater extent than acids like citric or tartaric: the former are "strong" and the latter "weak."

In ordinary analytical processes, acidity and alkalinity are measured by titration, but this only gives the total amount of acid or alkali present—it does not tell us whether the acid is "strong" or "weak." For instance, in two different solutions there might be sulphuric acid and citric acid both requiring the same amount of caustic soda to neutralise them. Yet they would behave very differently as regards their powers of corroding metals or of inverting cane sugar.

The real "acidity" figure should, therefore, express the amount of hydrogen-ions present, but this is, in many cases, an inconveniently small figure. For instance, in the case of one-thousandth normal hydrochloric acid solution (0·0365 gram per litre or 0·00365 per cent.) there is only 0·001 gram-ion of hydrogen per litre. In pure water there is present only one-ten-millionth gram-ion—this corresponding to neutrality, for here the hydrogen (H^+) ions are exactly balanced by the hydroxyl (OH^-) ions.

Therefore, in order to avoid the use of these somewhat clumsy figures, the "pH" scale was devised, in which

$$pH = \log \frac{1}{\text{hydrogen-ion concentration}}.$$

Now taking pure water as an example,

$$pH = \log \frac{\frac{1}{1}}{10^7} = \log \frac{1}{10^{-7}} = 7$$

That is to say, the neutral-point corresponds to pH 7. One rather confusing point about this scale is that as the acidity goes *up* the pH goes *down*, and thus acid solutions are those which have a pH below 7 and alkaline solutions those which have a pH greater than 7. A useful thing to remember is that one-thousandth normal hydrochloric acid has a pH of approximately 3. Water is never found to have a pH of 7, as a matter of fact. Unless extraordinary precautions have been taken, distilled water always contains some dissolved carbon-dioxide, which renders it very slightly acid. Hard waters, on the other hand, are slightly alkaline.

pH Control in Food Manufacture.

Sugar.—In the preparation of cane sugar, pH control is of the utmost importance. In the clarification or "defecation" process lime is added to the raw juice, which is then allowed to stand until the sediment has settled out. An excess of lime has, however, to be avoided because it leads to development of colour. Liming is regulated, therefore, so that the pH of the juice is between 8 and 9. It drops during the process, and should be between 7 and 8 in the clarified juice. Acidity is avoided, of course, because it leads to the formation of invert sugar.

In beet sugar manufacture, pH control is now being introduced despite certain initial difficulties.

In sugar work the pH method has been of particular value, because by means of it small acidities and alkalinities can be determined or regulated much more easily than by ordinary titration. Ranges of pH have been suggested for confectioner's glucose, for it is obvious that if the acidity is too high over-inversion will occur in sugar-boiling. Sjostrom suggests a lower limit of pH 4·3.

Gelatin.—The properties of gelatin, again, have been found to depend very much on pH. At 4·7, gelatin does not combine with either positively or negatively charged ions, and this pH is therefore called the "isoelectric point."

At higher pH values the gelatin combines with positively charged ions, such as hydrogen or metal-ions, whilst at lower values it combines with negatively charged ions.

The destruction of gelatin by heat is least at the "isoelectric" point, as one would expect. Further, the swelling in water, viscosity, and jelly strength are stated by Bogue to be dependent on the pH, the minimum swelling occurring at pH 4·7 and the viscosity and jelly strength being also at a minimum at or near this point. There are two points of maximum swelling, these being at pH 2·4 and 11·6, and there are also maxima for viscosity and jelly strength.

An important thing to bear in mind is that in various foods the gelatin has to function at the pH values of those products and not at those which necessarily bring out its properties most favourably. Gelatin should therefore be tested at the pH values at which it is to be used.

Fruit Jellies.—The properties of fruit jellies have been shown by Tarr and his co-workers of the Delaware Agricultural Experiment Station to depend very closely on the pH values of the juices from which they are prepared. They found that above a pH of about 3·55 a fruit juice did not form a jelly, and also that a maximum for jelly strength occurred at a pH of approximately 3·0. Below this value the jellies were weaker.

Jam.—The importance of these observations to jam-making operations is obvious, although the problem is complicated by another effect which is produced by pH during the boiling process—namely, the inversion of sugar.

Bread.—In bread-making also, a study of pH is of the greatest value both as regards diastatic activity, which has its maximum at values ranging from 4·5 to 5, and swelling power of the gluten, the colour and the texture. Jessen-Hansen states that the best pH value for dough at the time of baking is 5·0.

Canning.—In canning processes the lower the pH the lighter the degree of heat necessary for sterilisation. For this reason fruits, which have low pH values, require less processing than meat, fish, etc., the pH values of which are high.

It is of interest to note that moulds will grow at lower pH values than bacteria, and that they prefer a slightly acid medium, whereas most bacteria show preference for a slight alkalinity. It is a matter of common experience that fruits usually go mouldy, whilst meats are more open to attack by bacteria, the fruits being the more acid.

Brewing.—Finally, in modern brewery practice control of fermentation is effected to some extent by means of pH, for the different fermentation organisms grow best at various definite values. By these means, therefore, it is possible to prevent the growth of undesirable organisms.

Many more applications of pH control to food manufacture might be cited, but the only object of these notes is to show the types of the effects produced. For any particular industry there are nowadays usually many articles in the technical journals dealing with the subject, and in many instances fairly full reference is made to the bearing of pH in modern textbooks on particular industries, or else the subject is discussed in one of the several up-to-date books on "Hydrogen-ion Concentration," of which the best-known is that by Clark. This book, entitled *The Determination of Hydrogen-Ions*, was reviewed by Dr. W. Clayton in the June, 1929, number of FOOD MANUFACTURE, p. 168.

(To be continued.)

Enquiries

87. Required, particulars of the kind of strawboard, glue, and waxed bag best adapted to packing table salt in cartons.

88. Wanted, names of firms making an onion peeling machine for pickle manufacturers.

89. Wanted, name of book on the packing of pork and beans.

90. Could you give us the name of recently published textbooks dealing with the vacuum treatment of foodstuffs?

91. Required, practical recipes for marmalade.

92. Where can one obtain particulars of the process of syruping peels by the vacuum method?

93. Required, the name of a firm making a machine for pepper sifting.

94. Required, names of firms importing Soya Sauce.

95. Wanted, recipes for a cheap, thick sauce.

96. Can you put us in touch with firms making solid carbon-dioxide?

97. Wanted, names of firms making plant for refining lard.

"Slim" Practices

IT is gratifying to note that the Federal Trade Commission has called a halt to the internecine (and unsavoury) conflict between certain cigarette and candy advertisers that has been waged for some time now in the States. Readers will recall the references we made to these childishly mean antics. The Commissioners have ordered an unnamed advertiser to desist, who has been giving publicity to the assertion that smoking —— cigarettes will result in slender figures, and that "overweight is banished." This puts an end to a campaign which has occasioned much bitterness of feeling and much acid comment on both sides. We hope that these "fair weather" conditions will spread to this country.

Vacuum Filling of Liquids

By C. S. DU MONT

(*European Sales Representative for the Karl Kiefer Machine Company.*)

The importance of correct machine construction. Light and heavy liquid filling surveyed. Vacuum v. pressure filling. Handling miniature bottles. Some thoughts on air contamination.

FOR THE filling of liquid, and what, perhaps, might be termed semi-liquid products, there are various methods and various types of machines. By liquid products I refer to such articles as wines, whiskies, brandies, perfumes, extracts, essences, oils, etc., while semi-liquid products are those of a more or less viscous nature that may be filled into jars, cans, or bottles.

To the uninitiated a filling machine is expected to operate as well on one product as another. Even to many with experience it would seem feasible to use the same kind of machine to fill bottles with ammonia that would be used for filling extracts or wines. This, however, is impossible. Wines, or any liquids of an alcoholic content, must be handled through bronze machines, or machines that are silver-plated or tinned, while ammonia must only be handled through machines that are constructed of iron. Then, again, it might appear practical to fill cans with paints or varnishes with the same machine that would be used for light liquids, but this is not advisable, as will be pointed out later. A machine to fill mustard, creams, salad dressings, and similar products should be of a different type and should be operated under a different principle to that used for the filling of light liquids.

The Old Method.

Of course, the oldest method of filling—a method that still may be used in some antiquated plants—is to fill a bottle from a faucet, or connect a hose to the faucet and fill bottles from the hose. Such a method is obviously very expensive, for the reason that inaccurate filling results and a great deal of drip, spill, and loss of product ensues.

This pressure system, however, is thoroughly practical on many products, providing it is incorporated into a machine where a multiple of filling stems actuated by a single effort permits the filling of several bottles at one time. This type of machine has been developed to the extent of filling four, six, or even eight bottles at a time, thus permitting rapid filling and also accurate filling. There is an objection to filling under the pressure principle as broken, cracked, or imperfect bottles will receive the liquid, and this liquid will leak out, causing a loss, and then there is also the objection that there is a drip from the stems.

Pressure Machine Development.

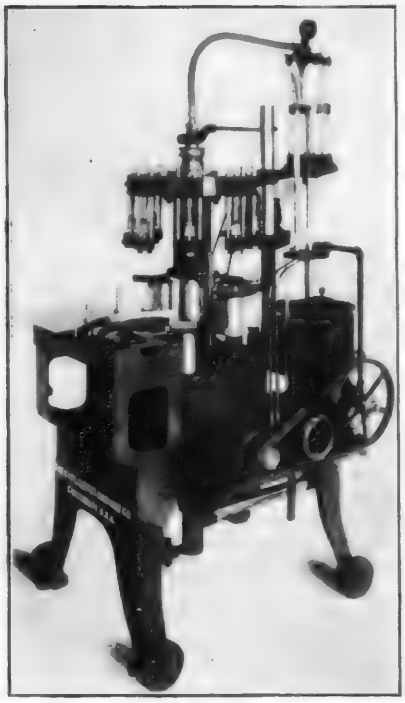
However, pressure machines have been developed so that with one operator it is possible to fill quart whisky bottles, for instance, at a speed of 20 per minute, and such a machine is not expensive. With this machine all bottles are filled accurately and with the least possible loss. Under ordinary circumstances, in filling whisky the loss due to imperfect bottles or to drip or spill would probably be less than one-half of 1 per cent.

In the filling of small bottles, especially bottles for whisky and wine samples, extracts, essences, drugs, perfumes, etc. (where the percentage of imperfect bottles is very often much greater than it is on the larger, sturdier bottles), the pressure type of machine is not desirable, because of excessive loss of liquid, slop, and spill. Therefore, the vacuum filling machine has been developed.

Handling All Sizes of Bottles.

The value of filling products by the vacuum method is the elimination of the possibility of filling broken, cracked, or imperfect bottles. Filling by the vacuum method by any machine is filling under a partial vacuum—not under a complete vacuum—and the reader must understand that the vacuum used is simply sufficient to fill the product into the bottle. It does not exclude all air, and it does not prevent air contact, as is sometimes imagined. The object

Feed Conveyor (Middle Foreground) delivering empty Bottles to Kiefer 24-Stem Vacuum Rotary Filling Machine, from which filled Bottles are conveyed to Automatic Screw Capping Machine.



Kiefer 8-Stem Rotary Vacuum Filling Machine.

is to use as little vacuum as possible, and machines have been developed with the idea of eradicating the risk of disturbance to the product. For instance, a machine is built that is handling whisky bottles from 6 oz. to 40 oz. sizes, and also flasks, round bottles, and gin bottles. The machine is adjustable to all sizes, and quickly adjusted when changing from one size to another, and this machine, with one operator to supply the bottles to the machine, has a capacity of five cases, two gallons to the case, per minute, or 300 cases per hour. Filling is accomplished with absolute accuracy, every bottle filled exactly to the desired height; broken, cracked, or imperfect bottles are automatically discarded, and there is no loss of liquor, nor any drip or spill, and the maximum vacuum is only nine inches.

A machine of the above type is expensive, and can only be successfully used by the largest bottlers where a large capacity is to be handled at the lowest cost of production.

Varying Capacities.

To accommodate bottling firms with various production requirements, there has been developed machines of varying capacities, so that it is possible to procure a machine of any type desired to produce the maximum quantity with the minimum of effort and labour cost in the particular plant where the machine is to be installed. Of the vacuum type machines built by the firm represented by the writer, there are ten different types and sizes, so that each individual bottler's requirements may be properly taken care of.

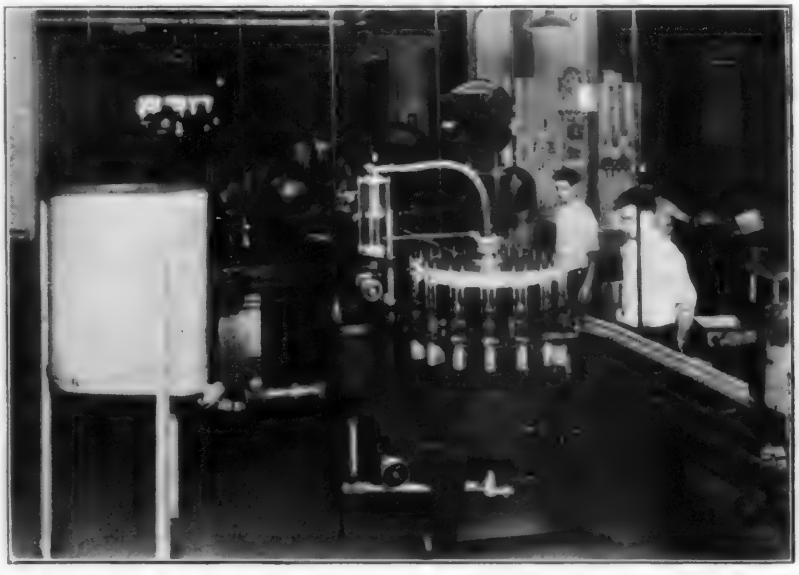
In addition to liquor bottling, there are other industries where this cleanliness and accuracy of filling is very important. As an illustration, take the matter of filling olive oil. Recently the writer installed a machine for filling olive oil into varying types and sizes of bottles. Obviously, it is necessary that such a machine must fill not only with a high degree of accuracy, but it must fill without any possibility of drip, and it must not fill broken, cracked, or imperfect bottles, for the reason that if any oil gets on the outside of the bottle there is added expense in washing and cleaning. These points were carefully considered, and now that the machine has been in operation for several months, it has proved that not only is it possible to fill a 4-oz. bottle, but also a 24 oz. or 26 oz. bottle, and all with an equal degree of accuracy. A capacity of 20 to 40 bottles per minute is secured on a comparatively small and inexpensive machine.

Another illustration of the value of the vacuum type of machine and the value of having a variety of styles and sizes of machines to select from, is the installation made for coffee essence. On very small bottles a standard type is used which permits of their being filled at a speed of 60 to 70 bottles per minute —in fact, a capacity of 90 bottles per minute may be secured.

The Vacuum System.

With an automatic machine three larger sizes of bottles can be handled all on the one machine with simple adjustments, and a capacity of 70 8-oz. bottles per minute is produced with only one operator.

(Continued on p. 92.)



Feed Conveyor (Right-hand Corner) delivering empty Bottles to Filling Machine. Capping and Wrapping Operations shown in Background.

Trade News

The Thirty-fourth International Bakers' and Confectioners' Exhibition and Market will be held at the Royal Agricultural Hall, London, from September 6 to 12.

* * *

We understand that the John Davies Insulating Co., Ltd., of Liverpool, is fitting up a large range of insulated spaces at the new Liverpool abattoir, which is the largest of its kind in Europe. This firm manufactures its own insulating materials, such as slab cork, and all equipment necessary for handling and stowing the various classes of food requiring refrigeration. The "J.D." unit system is installed on the new liners of the Canadian Pacific Steamship Ltd.

* * *

The address of the London representative of the Corrugated Packing Materials Co., Ltd., Manchester, has been altered to Dominion House, Bartholomew Close, E.C. 1.

* * *

The Liverpool office of the British Thomson-Houston Co., Ltd., has been moved to new premises at 27-29, Stanley Street, Liverpool. Mr. A. D. Mackinnon has been transferred as manager from Glasgow to Middlesbrough, and Mr. S. Nichols from Middlesbrough to Liverpool.

* * *

The sixth Annual General Meeting of the New Health Society, held on January 30, included a brief report on Canned Foods, issued under the auspices of the Food Committee. In summing up the whole subject of canned foods, the committee stated that it might be concluded that canned foods were safe sources of nutriment, giving the full protein, caloric, and vitaminic value of the fresh foods from which they were prepared by the most approved methods, and might be used with every confidence to complete the daily ration where, for any reason, whether productive, economic, or for convenience, the entire use of fresh foods is impracticable. The committee added, however, that it must be clearly understood that, as a general rule, fresh foods were to be preferred to preserved foods, and that there was at present considerable variation in the dietetic value of canned products.

* * *

At the recent dinner given in Gloucester to the staff and employés by the directors of Messrs. William Gardner and Sons, Ltd., it was recalled by the Chairman (Alderman C. E. Gardner) that his father founded the firm in 1859 with four employés on the pay roll. At this gathering there were over 100. They were increasing and improving their premises each year, and were adding new machinery to keep the plant up to date. No firm in these days could afford to stand still. Their sales department had been completely reorganised some years ago. The machines they were turning out were going all over the world. The Mayor, who was present at the gathering, congratulated the employés on having such directors and the city on having firms of the standing of William Gardner and Sons.

* * *

We have received an excellent and recently issued brochure, entitled "Better Valves," from Gummers Ltd., of Rotherham, illustrating an entirely new departure in valve construction. The great trouble experienced in all steam plants has been that of leakage, but it is now possible to supply a valve in which this trouble is claimed to be entirely overcome.

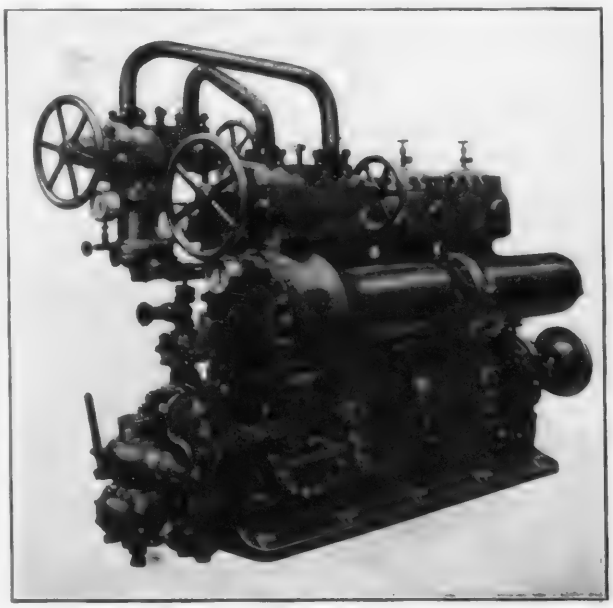
* * *

Sulzer Bros. have sent us their Technical Review No. 4, which contains an article on "Small Refrigerating Plants for Making Ice-Cream." This gives an interesting and plain description of the manufacturing processes in general use. It is stated that in the United States the temperature of the hardening room is being always more and more lowered. About twenty years ago +14 to +5° F. was thought satisfactory, but now −5° F. is demanded, and there are hardening rooms in existence with temperatures of −20° F.

We have also received a useful brochure on the Sulzer Diesel engines.

* * *

The accompanying illustration is a photograph of a sixty-ton 4-cylinder ammonia compressor built by L. Sterne and Co., Ltd., of Glasgow. We understand that these machines have been installed, amongst other places, at the Birkenhead Lairages of the Mersey Dock and Harbour Board, and at many of the C.W.S. branches.



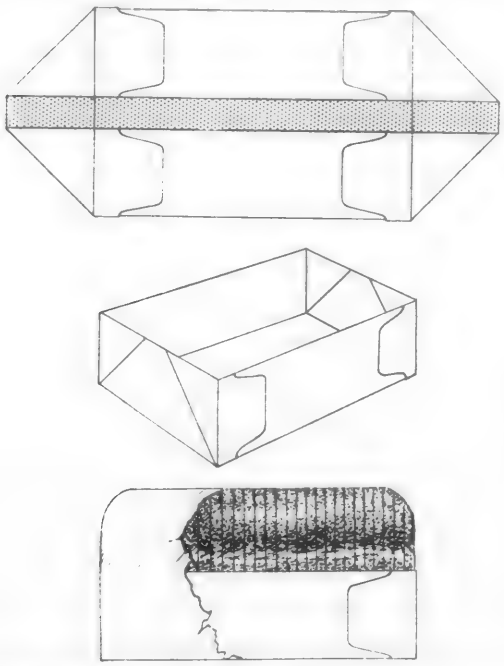
G. J. Worssam and Son, Ltd., issue a brochure on Refrigeration for the Dairy and Creamery, which gives much useful information and data on the subject. The same may be said of Messrs. Worssam's catalogue of Ice-Making and Cooling Machines (CO_2 System).

* * *

The following notes refer to the Papendick Bread Slicing Machine illustrated below. This machine is very simply constructed. It is quite compact, being 23 inches at its widest part, with an over-all length of 8 feet.

There are two travelling bands on which the loaves are fed. The first band travels at a somewhat faster rate than the second in order that a constant feed is obtained for the knives, and also to maintain a pressure just sufficiently strong to send the loaves past the knives.

The knives are fixed in two frames; they are equally spaced at a fixed distance apart, decided on by the thickness of the slice. These two frames are interspaced and arranged so that as one frame gives an upward cut, the other gives a downward cut at the next slice, and thus keeps the loaf rigid in the machine. As a result, an even cut is obtained, and bread, the centre of which is at a temperature of 114° F., can be cut quite cleanly.



All the running parts of the machine are in oil baths, whilst vibration is practically non-existent. It is a small, compact machine, electrically driven, and in which the blades can easily be replaced by means of tension screws. The capacity is 1,000 loaves per hour.

Such a machine can be linked up with a fully automatic plant by inserting it between the cooling rack delivery end and the wrapping machine.

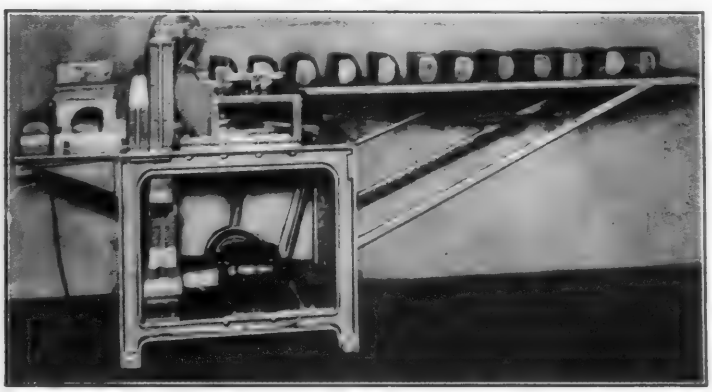
The type of tray used for carrying the sliced loaf is illustrated here. The loaf is then wrapped with wax paper.

* * *

We have received from the Pulsometer Engineering Co., Ltd., some particulars of their "Geryk" Air Pump, which will be given in next month's issue. These pumps are used in connection with food desiccating and similar work.

* * *

The illustration given on p. 68 is that of Messrs. J. and E. Hall's vertical, enclosed, high-speed ammonia compressor, representing the latest practice. Machines of this type have been supplied to biscuit and chocolate factories for the manufacture of ice, and in connection with cold storage work for foodstuffs. The design of these compressors is based upon developments initiated in the evolution of the modern high speed reciprocating steam engine and the internal combustion engine. In view of the need for a more compact machine of lower first cost and with a higher output to weight ratio than is possible with the older designs, these machines have the motion work totally enclosed, are fitted with forced lubrication, and run at speeds which make it possible to couple them directly to a high-speed steam engine, an internal combustion engine, or an electric motor of normal size for the power required, and, therefore, of moderate cost, the last mentioned being most frequently employed. The belief that a high-speed machine must be more prone to break down and must wear out faster than a slow speed one is still encountered occasionally, but is, of course, fallacious. Scientific design, the use of improved materials, and particularly the application of forced lubrication, render the modern high-speed reciprocating machine an absolutely reliable and long-lived appliance. Forced lubrication, besides being far more efficient than the old methods, has the additional advantage of eliminating the need for practically constant attendance while the machine is running. In the case of gas compressors, and particularly those utilising a gas such as ammonia, with which the smallest leakages cannot be permitted, the totally enclosed design is particularly advantageous, since, even with multi-cylinder machines, there is only one gland on the main crankshaft to keep gas tight.



Above is an illustration of the Frigidaire Two-Hole Combination Ice-Cream Freezer and Storage Cabinet. This has a total ice-cream making capacity of approximately 4 gallons per day maximum. The freezer is driven by a direct coupled ¼ h.p. motor through a worm and a worm-wheel gear running on ball bearings. The interior of the cabinet is a galvanised iron brine tank. The ice-cream container is of monel metal, and is provided with a special device for agitating the brine. The ice-cream hardening and storage compartment is of sufficient size to take two 2-gallon ice-cream containers. The unit works automatically.

* * *

Henry Pooley and Son, Ltd., Birmingham, are specialists on tea sifting, cutting, and blending machinery, which they have developed to a high state of perfection. Their activities, however, extend to automatic mixing machinery of all kinds for industrial use.

Correspondence

To the Editor.

DEAR SIR,

The letter in your February issue written by Mr. Graig Bain of South Africa contributes nothing of interest to the subject under discussion. Having nothing useful or helpful to say, he proceeds to abuse, and wallows in personalities worthy of the *Eatanswill Gazette*.

It is not perhaps necessary to flatter Mr. Bain by replying to his personal attack. Leading chemists and experts in the food packing industry in England are constantly conferring with me, and much of what I write is the sum of such conference.

As a member of the Food Canning Council, the Food Manufacturers' Association, and as a keen supporter of food packing, my reputation is secure against the jaundiced attacks of Mr. Bain.

His letter, however, gives me an opportunity of emphasising the following points, and of correcting an impression which various writers in these columns have from time to time been under.

There is amongst food packers in England no discussion whatever as to whether food cans are better lacquered or unlacquered. They practically all use lacquer, and the practice is greatly on the increase.

The only discussion going on is in regard to possible improvements in the lacquers used and better methods of application.

The actual methods of canning are also under discussion, and improved methods are being tried and adopted.

The articles in these columns on Lacquer *v.* No Lacquer are more or less academic, and, useful as such discussions are, they do not affect the use or non-use of lacquer in actual shop practice, where, as I have pointed out, the lacquered container and closure is being more and more used.

To return to Mr. Bain, he objects to my having stated that "English packs of fruit are superior in colour and flavour to foreign importations," particularly in the case of "strawberries, damsons, loganberries, raspberries, and black currants." At the same time, his bosom swells with patriotic pride as he booms forth, "I am British born, British in instinct, and in purchases will always endeavour to favour Britain." It is quite like an old-time melodrama!

However, I still maintain my opinion, which was endorsed at the last National Canning Convention held in London in December, where the increasing demand in foreign countries for English canned fruits was also referred to.

My main object in contributing to these columns is the desire to help British canners in their canning problems. I believe such little help as I can give is appreciated. If I fail to please Mr. Bain of South Africa, I am afraid it leaves me quite unrepentant.

Yours faithfully,

A. LE MATTHISON.

To the Editor.

DEAR SIR,

I have read with great interest the correspondence on lacquered cans which has been appearing in FOOD MANUFACTURE since July, 1929.

I have not entered into this correspondence before, as I did not think we in this country had enough scientific information on the subject to warrant our making any definite statements. Experiments are, however, being carried out at two research stations, but until these are completed it is not possible to say just how far our canners are likely to be troubled by the formation of hydrogen swells and springers.

The canning of fruit has made headway in this country during the past few years, and so far most canners have not had much trouble with hydrogen swells. This, I feel sure, is due largely, to the storage temperature being lower in this country than in America, and I feel sure also that when our canners commence to export to the tropics they will find this trouble a very serious one indeed.

A series of experiments were carried out at this research station during the summer of 1927, in which all the principal English fruits were packed. Two types of lacquer were tested, and single and double lacquered cans were used in each case. In the ordinary way the lacquer coating is generally scratched to a certain extent during the process of can-making, and for the double lacquered cans used in our experiments the second coat of lacquer was sprayed on after the cans had been made up. The cans were stored at room temperature, and for a period of eighteen months there was no trouble from swells or springers. The difference in colour between the fruit in the single and double lacquered cans was remarkable, such highly coloured fruits as raspberries, loganberries, black currants, and damsons keeping their colour perfectly in the double lacquered cans. The scientific details in regard to these tests have not yet been published, but the canners in this country were advised at the Conference in May, 1928, of the advantage of using double lacquered cans from the point of view of the retention of the colour of soft fruits. I think Mr. Matthison's letter is based largely on these results, and when he speaks of comparing English and foreign packed fruit he refers principally to soft fruits.

In carrying out comparative tests between English canned soft fruits and those of foreign origin (not necessarily American), I must—in spite of Mr. Graig Bain's protest—claim that the British packed soft fruits have been better in colour and flavour.

I think the food-preserving industry in this country owes much to Mr. Matthison for the interest he has taken in endeavouring to improve the appearance of containers for preserved food. I also know, from my personal experience, that Mr. Matthison is only too glad to help anyone who is interested on the research side, either in lacquers or anything appertaining to the preservation of food, or, for that matter, other products in metal containers.—Yours faithfully,

J. HIRST.

UNIVERSITY OF BRISTOL, FRUIT AND VEGETABLE PRESERVATION RESEARCH STATION, CAMPDEN, GLOS.

To the Editor.

DEAR SIR,

On page 36 of the February issue of FOOD MANUFACTURE I notice a statement that the twisting of wire round the outside of a case is not very effective. I think it only right to point out that such a statement is not in accordance with general experience, and that both in America and in Europe the box bound with wire has proved itself so much stronger that thinner boards can be used. As for the statement that it is quite easy to untwist the wire and replace it, this must apply to some very inferior type of twisting wire, for the ordinary pliers, although they might untwist it, could certainly not get the wire back.

Another statement on page 57, that hoop iron banding machines are as speedy as the wire ones, is incorrect. There is an automatic wiring machine which will wire-bundle at the rate of 32 wires per minute, and if there is or ever has been a hoop iron binding machine that can come anywhere near this I should very much like to know the name of it.

Yours faithfully,

J. CHEESMAN.

To the Editor.

DEAR SIR,

We have read with interest the letter of your correspondent which refers to the article on "Packing Developments" in your February issue.

At present, wire binding and the flat hoop iron band both have their respective champions, and the market is probably divided equally between them, but it would appear that where the maximum strength and security are required, at perhaps a slight sacrifice of speed (not essential but generally so as the flat bands require more care in handling than a round wire), the flat band is preferable.

The yield point of wire generally used is in the region of 300 lbs., and such wire can be untwisted by the bare fingers and with care re-twisted with pliers, as your article states.

It is essential that it be on the soft side, otherwise before it lay flat round the case the edges of the case would be cut right through.

This appears a strong argument against wire, that it cuts the fibres of the wood and tends to weaken the case, whereas a flat band with a greater bearing surface compresses the fibres of the wood and thereby strengthens the case.

An example occurred recently where a shipment of twenty-two thousand wire-bound cases arrived in this country so badly damaged that they were not fit for distribution. Recasing, owing to cost, was out of the question, and a solution was found by re-coopering with a flat hoop iron band, tensioned and sealed, with completely satisfactory results.

Wire binding may be a little more speedy than flat banding, but a machine that can tie faster than it can possibly be fed is impracticable.

A flat banding machine has been designed and patented (British Patent No. 221,284 of 9/9/24) for speed, but it was found that the demand for such a speedy machine did not exist, and further manufacture was not proceeded with.

Yours faithfully,

"BOXER."

The Preserved Fish Industry of Czechoslovakia.

The first factory for preserving fish was established in Czechoslovakia in 1860, according to a report of November 6, forwarded to the U.S. Department of Commerce by E. Woods, at Prague. By 1890, the enterprise had proved so successful, several other factories were opened up in various parts of the country. To-day there are 20 factories engaged in this industry in Czechoslovakia. They employ 3,500 to 4,000 workmen and have a total annual capacity of 13,000 to 16,500 short tons of raw fish. The production for the year 1928 had an approximate value of $1,800,000.

In the early days of the industry no machinery was used in the preparation of the fish, as all the work was done by hand. To-day all the factories are equipped with the most modern machinery.

Carp, the production of which is large in Czechoslovakia, and imported herring, are used principally in these factories. Nearly all the herring comes from the North or Baltic Sea, and is mostly of German or Scandinavian origin.

The raw fish is shipped to the factories packed in ice, and is usually worked up immediately after arrival.

The principal products of the domestic factories are pickled and smoked herring and marinated fish.

The domestic consumption of preserved fish is especially large in the mining districts and industrial centres of the country.

Postponement of Italian Marking Requirements for Canned Fish.

By Royal Decree of October 3, 1929, published in the *Gazzette Ufficiale* for October 23, the Italian Government has permitted fish which are not properly marked according to the regulations of July 7, 1929, to be handled and sold by stores until December 31, 1930, according to a report dated October 24, furnished by J. M. Kennedy, at Rome. This decree applies only to such fish products as had been brought in and stored in these establishments not later than June 30, 1929. It is understood that this action was taken because there is still held in retail stores in Italy a considerable quantity of fish products packed in containers which do not meet the requirements of this law. This extension will enable the fish already on hand to be disposed of.

Under the regulations mentioned above, it is forbidden to import or sell fish products contained in boxes or other receptacles when the following markings are not stamped or lithographed on the metal containers in an indelible way or burnt into wooden containers or stamped in relief on glass containers:

> Name of product contained therein; quality of oil or other substance used for conserving the product; net weight of product; name of producer; place of production.

Where the product was well known through a trade-mark registered at the Ufficio del Marchio, the last two requirements could be obviated.

Central Canned Fish Purchasing Bureau at Stavanger, Norway.

The price control plan adopted by the Norwegian Canners National Association (De Norske Hermetikfabrikkers Landsforening) last January is said to be functioning satisfactorily, although it is reported that a few of the smaller packers appear to be dissatisfied, according to information contained in a report of October 26, by American Vice-Consul F. C. Sigmond, at Stavanger. Minimum prices as well as maximum commission or discount rates fixed by the "Price Council," are reported to have prevented sales at unprofitable prices, and even though fishing has been very good this year, prices have remained steady with practically no fluctuations. However, in order to maintain minimum prices of the standardised fish products—namely, smoked sardines in olive oil and kippered herrings—there has been organised a central purchasing bureau or clearing house for the purpose of taking over stocks of the above-mentioned products from packers who are unable to dispose of their goods or for financial reasons are not in a position to carry a large stock, and if necessary temporarily withdraw them from the market. The bureau will co-operate closely with the Price Council and if stocks appear to be considerably above requirements, production may, if advisable, be curtailed.

The share capital of the purchasing central, De Norske Hermetikfabrikkers Indkjobscentral A/S (The Norwegian Canning Factories Purchasing Central, Ltd.) is reported to be 500,000 kroner ($134,000), of which 50 per cent. has been paid in. Only canners who have signed the agreement of adherence may become shareholders; the size of the canneries determines the number of shares of 1,000 kroner ($268) each member is entitled to. According to the by-laws of the bureau, sales may be made only to shareholders, or to exporters who are adhering members, although not shareholders, of the price control scheme; however, packers are given

preference. The company, which will have its business office in Stavanger, is prohibited from engaging independently in the export business.

Italian Market for Canned and Preserved Foods.

While the Italian consumption of canned and preserved foods has never been large, it is increasing steadily, and is being encouraged by the active efforts of the domestic packers, supported by the Government, according to a report dated October 16, 1929, received in the U.S. Department of Commerce from Hugh S. Miller, at Milan.

The Italian people have little or no natural inclination towards canned or preserved foods. This lack of interest may be attributed to several factors, one of which is their reluctance to depart from the traditional diet of paste foods and rice, supplemented with a somewhat limited assortment of meats and vegetables. The fact that servants are cheap and easily obtained, and that, if not employed, there is usually some of the family in a sort of dependent capacity who can do the work, nullifies one of the principal points on behalf of canned foods, that of convenience in preparation. Furthermore, fresh fruit and vegetables are plentiful during most of the year. Finally, most of the Italian people still entertain a prejudice against canned and other preserved products on the ground that it is not healthy to eat them, or at least that they are not as nourishing as the fresh products.

It has only been within the past few years that the domestic manufacturing industry has been of sufficient importance to attract public attention, and prosperous enough to spend the money necessary for the advertising and proper distribution of its products. The following tabulation, compiled from figures supplied by the Federazione Nazionale Fascista delle Conserve Alimentari, an organisation of producers, shows production and exportation of canned and preserved foods in Italy during the year 1928:

ITALIAN PRODUCTION AND EXPORTATION OF CANNED AND PRESERVED FOODS, 1928

Commodity.	*Production.*		*Exportation.*	
	Pounds.	*Value.*	*Pounds.*	*Value.*
		£		£
Jams and other fruit preserves	29,786,350	796,438	6,980,205	185,376
Tomato paste	156,295,100	3,731,316	72,293,464	2,589,068
Peeled tomatoes ...	143,682,600	1,509,293	132,547,607	
Fruits and vegetables in vinegar, brine, oil, or natural	52,204,900	997,053	17,151,127	327,696
Total	381,968,950	7,034,100	228,972,403	3,102,140

The present market for canned foodstuffs is chiefly for products not packed in Italy, and for certain lines that have the reputation of being superior in quality to the domestic output. While the former would appeal to all classes of buyers, it must be considered that the mass of the people cannot afford to purchase any large amounts of canned and preserved foods. Wages are low, and the average family income is small. The sale of preserved foods of higher quality than those produced domestically would, of course, be limited to those who have the means to indulge their tastes.

According to importers and others familiar with the trend of the trade, the Italian market, though chiefly interested in the cheaper products, will pay for superior brands and qualities.

Efforts to Organise the Norwegian Herring Trade.

According to statements made by Mr. T. R. Olsen, director of the Sildeoljefabrikkernes Salgscentral A/S (Sales Organisation of the Herring Oil Factories), and forwarded to the Department of Commerce on November 22, 1929, by American Trade Commissioner Gudrun Carlson, at Oslo, the outlook is favourable for organising the herring industry in Norway for the benefit of its members.

Until last year the trade in herring lacked any kind of organisation. The prices that the herring oil factories paid were the basis of all sales, regardless of whether the fish was intended for human consumption or for oil and meal, with the result that the fishermen themselves have often received a low price for their product. The unregulated export of fresh herring has made amounts available for the factories irregular.

Since it is of vital importance to the factories to have an estimate of the raw material available to them, an attempt was made last year to organise the herring trade by forming a central buying organisation. The herring oil factories divided the west coast into four districts and the management of the buying organisation is now composed of a member from each of these districts. All the factories belonging to the organisation furnish information as to their productive capacity and the amount of herring they expect to use. During a poor season this information is used as a basis for an equitable division of the raw material.

At the same time, efforts have been made to regulate the export of fresh herring so that the whole fishing industry will become more stabilised.

Norwegian Interest in Exportation of Quick-frozen Fish.

With the development of the brine quick-freezing processes, the exportation of frozen fish from Norway is receiving considerable attention, according to a report, dated November 13, 1929, received in the U.S. Department of Commerce from Gudrun Carlson, at Oslo.

In Norway the new methods are of particular importance in connection with the shipment of herring to Central Europe. Herring is caught in the fall and winter seasons, and it is at this time that the demand for fresh fish in Central Europe is greatest. The herring could be brought directly into the freezing plant, and in about four hours would be ready for

shipment to Continental Europe. In line with the effort to export more fresh fish from Norway the State railways have issued a booklet of instructions called "Export of Fresh Fish and Herring in Refrigerating Cars." It emphasises, in particular, the German markets. Information is given regarding packing, sales, rules for transporting, freight, time and routes for export, best days for Berlin market, collections, etc.

French Duties on Sugar and Sugared Goods Increased.

The French Government has increased the duties on refined sugar and goods containing sugar by a law of November 28, retroactive to November 19, according to a radiogram received at the Department of Commerce from Commecial Attaché F. W. Allport, Paris. The rate on refined sugar has been increased from 100 francs to 140 francs per 100 kilos net weight, and on canned pineapples prepared with sugar, from 150 francs to 235 francs per 100 kilos net weight, and on other canned fruits from 50 to 135 francs per 100 kilos net weight. In addition, canned fruits are now dutiable on the actual sugar content plus one-fourth of the internal consumption, and refining taxes on sugar based on the total net weight of the product. The consumption tax has been reduced from 100 francs to 85 francs per 100 kilos, while the refining tax remains at 2 francs per 100 kilos. The duties on other products with high sugar content have also been increased.

Goods shipped prior to November 19 are not to be subjected to the new rates.

Adulteration of Nestlé's Condensed Milk in Netherlands East Indies.

In a report, dated September 28, 1929, to the Department of Commerce, Don C. Bliss, at Singapore, mentions the practice of native dealers of Nestlé's condensed milk of substituting an inferior brand of canned milk for Nestlé's Milkmaid brand and allowing it to spoil in order to collect damages. It appears that the Chinese dealers open the tins, remove the milk (which is doubtless marketed through a coffee-shop), and then put an inferior brand of milk, possibly diluted or adulterated, into the cans. This is then deliberately allowed to spoil, when it is returned for damages. In this manner the difference between the cost of the two brands gives a small profit in addition to what can be secured from the sale of the milk.

Japanese Pressed Caviar (Karasumi) to be Marketed in the United States.

The Nagasaki Marine Product Experiment Station is planning to market in the United States, through one or two exporting firms, the marine food product known to the Japanese as karasumi, according to a report, dated November 16, 1929, forwarded to the Department of Commerce by American Consul Henry B. Hitchcock, at Nagasaki, Japan. This is a kind of caviar prepared from the roe of the grey mullet by processes of salting and drying under pressure. It has long been held in high esteem by the Japanese, but in recent years, owing to the high price, it has not found a ready sale in domestic markets. It is believed by the trade that the United States, with its greater purchasing power, would form the best market for the product provided it were found to appeal to Occidental tastes.

While certain quantities of karasumi are produced in the prefectures of Wakayama and Shidzuoka, the product has always been associated in the minds of Japanese with Nagasaki, where the largest quantities and highest qualities are produced. Nomosaki (Cape Nomo, the peninsula extending to the south of Nagasaki harbour) is the locality around which the industry is centred.

The season of preparation is from late fall until the middle of winter, when at Nagasaki there is the highest percentage of sunny days and the weather is sufficiently cold to enable the work to be carried on without deterioration of the roe. Karasumi will keep through several months of cool weather, but spoils rapidly in warm weather.

The annual production in Nagasaki prefecture is about 86,000 ounces valued at yen 35,000 (£3,500). As the annual catch of grey mullet in all Japan usually exceeds 16,500,000 pounds, it is believed the resources are sufficient to supply what market may be developed for karasumi in the United States.

The Illinois Conference.

Agricultural research will contribute more than anything else toward the future expansion of the canning industry, W. A. Huelsen, of the Horticultural Department of the University of Illinois College of Agriculture, told the conference visitors in an address on "Needed Research in the Canning Industry."

"An absolutely pioneer field exists for agricultural research on biological reactions in their relation to manufactured food products. The restricted knowledge that we now have indicates that there is a tremendous opportunity for splendid research along new and novel lines.

"At present we find the canning industry ready for a programme of vigorous and unlimited expansion, but uncertain and hesitant about embarking upon it because lack of scientific knowledge prevents prediction in advance as to the grades of goods that will be packed from season to season. In several sections of Illinois, canners wish to diversify by growing and canning pumpkins in addition to other crops. A number of such attempts have failed. The pumpkins can be grown, but there is something about the raw product which gives a poor colour and a bitter flavour, rendering it unsuitable for consumption. A study of varieties, soils, and plant food requirements is urgently needed."

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Imported Cardboard Boxes: Should they be marked?

A Merchandise Marks Enquiry

THE interests of British food manufacturers were raised at an enquiry under the Merchandise Marks Act, which was opened at the Board of Trade on Monday, February 17, when an application was made by the British Paper Box Manufacturers' Federation, supported by kindred associations, for imported containers made of paper or cardboard to bear an indication of origin.

The opponents were the Food Manufacturers' Federation, the Manufacturing Confectioners' Alliance, and others.

Mr. W. B. Faraday, who appeared for the applicants, said that the Federation represented 75 per cent. of the total output of cardboard containers in the country, and gave employment to 31,000 people. The demand for cardboard containers was an increasing one, as the public demand increased for packed goods on the grounds of cleanliness as well as for advertisements. If firms bought British cartons they knew that they were absolutely guaranteed to be non-poisonous, and that any colouring matter in the container was hygienic and free from arsenic. The main ground of opposition seemed to be that the opponents thought that consumers might think the contents as well as the container was foreign if the container was marked "foreign," but it was a simple matter to print "Box made Abroad" or "Box only made Abroad."

Mr. S. W. West, of the Dairy Supply Co., Ltd., Park Royal, giving evidence on behalf of the opponents, said that if a purchaser was buying a British carton he would know that he was buying hygienic goods. Fifty per cent. of the manufacturers of cardboard cartons in this country held the certificate of the Society of Hygiene.

Evidence was given by Mr. William Hooper Davey, head of the joint buying department of Messrs. Cadbury Brothers and Messrs. J. S. Fry and Sons, Ltd., Bristol, and also by a representative of Messrs. Carsons, Ltd., chocolate manufacturers of Bristol, to the effect that there were certain types of containers, notably for Easter eggs, and certain types of chocolate containers and boxes, which could not be obtained in England of the requisite quality.

The representative of Messrs. Carsons, Ltd., added that he felt that if the word "foreign" were placed on the container the purchaser would assume that the contents were foreign as well.

Mr. F. K. Artis, the Chief Buyer of Messrs. Crosse and Blackwell, Ltd., food preservers, said that the purchaser of food articles was not interested in the country of origin of the cardboard container, but in the contents. To mark the containers "foreign" would have a detrimental effect on the sales of certain products of his firms.

Mr. R. P. Redman, director of Messrs. C. and T. Harris, Ltd., manufacturers of fresh sausages and prepared and cooked foods, said it would be detrimental to their trade to have boxes marked "foreign," as he did not think the people would realise that only the box was foreign. They had already had complaints that the British bacon they supplied was Danish, because the wrappers had been marked "Danish."

The enquiry was adjourned.

Abstract of Paper Read before the Society of Public Analysts on Wednesday, February 5, 1930.

Preliminary Studies in the Bacteriology of Wheat and Flour. By D. W. Kent-Jones, Ph.D., B.Sc., F.I.C., and A. J. Amos, B.Sc., A.I.C.

A definite and satisfactory procedure for enumerating bacteria in wheat and flour has been devised. From the data so far collected it appears that freshly and normally milled patent flour contains less than 20,000 blood-heat bacteria, straight run flour less than 50,000, and lower grade flour up to 300,000 per grm. The cool organism content of any grade is nearly always greater than the figure for the blood-heat organisms. Storage of a flour results in a considerable decrease in the number of both forms. Many of the more common flour bacteria have been identified or their cultural and physiological characteristics established. Organisms of the *B. mesentericus* group are almost universally present in flour and bread.

* * *

We have received from J. B. Lippincott Co. a copy of *Meat and Meat Products*, by W. H. Tomhave, of the Pennsylvania State College. In this book of 418 pages, well illustrated, emphasis has been placed on the composition and food value of meat, the preparation and preservation of meat as food, carcase yields, market classes and grades of carcases, carcase judging, animal by-products, and meat inspection. Full discussion on the preparation of meat products for home use, meat rings, shipping meat, home tanning of hides, the handling of poultry, and the canning of meat are included. The various methods of preserving meats, pickling, salting, smoking, canning, and cold storage are also treated. Other home-manuals are: *Successful Canning and Preserving*, and *Food Purchasing for the Home*. Also, one might note, *Food Facts for Everyday*, and *Food Planning and Preparation*.

(*Continued from page* 84.)

The vacuum principle has its advantages. Vacuum filling machines are very desirable in a great many instances. But it is not practical to fill varnishes, for instance, by the vacuum method. With the vacuum principle the stem enters the bottle and seals at the bottle mouth. If the bottle is perfect and a seal is made perfectly, the vacuum then draws all the air out of the bottle. This is drawn out through a fine tube. As soon as the vacuum is established in the bottle the liquid is drawn from the supply tank on the machine into that bottle. When the liquid reaches the air tube or vacuum tube the overflow passes out through that until such time as the filling head is raised, this overflow going into the vacuator and

from the vacuator automatically back into the supply tank on the machine. In handling a product such as varnish, the contact of air with the varnish in the air or vacuum tube would cause that varnish to dry and harden in the tubes, and so would cause trouble in filling. Therefore, it is not at all practical to handle products of that kind by vacuum. Neither is it practical to handle mustards or heavy products by vacuum. It can be done, but to fill by that method means using high vacuum of 20 to 22 inches, and no better results, if as satisfactory, are obtained than can be got on other machines that fill by accurate measurement, using either special spiral gear rotary pumps or the plunger system.

A concluding point I would make is that where good, strong, sturdy bottles are used, so that naturally the percentage of cracked, broken, or imperfect bottles is practically nil, there is but little advantage in the vacuum system. It is valuable where bottles are small, or delicate, or easily broken, and where there would naturally be a loss due to that fact.

Vacuum Filling not always Essential.

Vacuum permits more rapid filling than may be secured under a pre-determined pressure or gravity fall, but the addition of the vacuum system also adds somewhat to the cost of the machine.

We believe firmly in the value of the vacuum principle for a great many products, but it is not a system that eliminates all other systems previously used. It has its advantages, and in many instances it is absolutely necessary, but it cannot be used for every conceivable product.

The purchaser of filling machines should discuss very carefully with the engineer or salesman his particular filling problems, and then, if that engineer or salesman is sufficiently informed on all types of filling machines, he in turn can suggest or recommend to the prospective customer that type and size of machine best suited for his purposes.

(*Continued from page 72.*)

It is up to them to decide whether those idle machines shall remain as they are or be turned into profit makers. It is no solution of the problem merely to say that the machinery shall run on making stock; that cannot go on indefinitely. It is often a dangerous policy in view of possible changes of public taste which might leave the warehouses full of useless material. Selling below cost or at a merely nominal profit may keep the workpeople employed, but it will soon show on the wrong side of the balance-sheet. No firm can live on shadow profits, because no one can foretell or control the extent of the losses entailed.

Machinery idle from any cause means loss of profits. It is a fairly simple matter to estimate closely the profits arising from each working machine and from this to calculate the cost of those that are still. All this will have to be accounted for ultimately, as every halfpenny so lost is also shown in the loss on the capital invested in those machines.

The inactivity of a part of the plant is not only a matter for the foreman to worry about; it is of prime interest to the factory manager, and it is of absolutely vital importance to the prosperity of the firm.

Consequently, when a machine is not at work, it becomes a matter of paramount necessity to get the correct answers to some of the questions that have been raised above.

(*Continued from page 77.*)

and wrapping, moulds will not be produced. In some of the largest American bakeries there has been no trouble with mouldy bread since the introduction of slicing.

The Progressive Way.

Wrapping of commodities has been found to be the path of progress, and it is likely that the development of slicing in conjunction with wrapping will mean progress for those who are sufficiently enterprising to adopt it, especially in its early days. Slicing of bread already is being carried out in this country, and now only needs developing.

There is one factor which must be borne in mind, however, which is, that it will be necessary to produce a high-quality bread, since with the slicing of any bread the faults and weaknesses, if any such exist, will be shown up far more quickly than when the loaf is not sliced. For good bread, sliced ready for use, and an extra charge made for doing so, there seems to be a great future in this country.

(*Continued from page 78.*)

who only knows one secret. Then why not share them openly? The man who keeps his trade secret is burying his talent in the earth.

A Possible Alternative.

This age is remarkable for its growth of sports clubs, social clubs, etc., for employees. There is also an attempt to have happier and healthier conditions inside the workshop and factory. Would not this ideal be more likely to be realised if the young men of one firm were encouraged to exchange views with the young men of similar firms? Such discussion would be immensely stimulating and valuable, and probably each firm would gain a great deal more than it could possibly lose by surrendering its own secret. Instead of one or two secret processes, they would have a continuous influx of new ideas, which would give life and vigour to the firm. Even in the Middle Ages the apprentices were known to wander all over Europe in search of new ideas. There is nothing so productive of new ideas as meeting other people and hearing or reading about their work and their difficulties.

Already free discussion and publication has been adopted by many trades in the United States of America, and it will be interesting to see whether similar developments will be established on this side of the Atlantic.

Current Literature

Fruit and Vegetable Products

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84. Pectin [in the Preparation of Jellies]. C. Griebel and F. Weiss. (*Z. Unters. Lebensm.*, 1929, 58, p. 189.)

85. Production and Distribution of Frozen Fruits in Small Cans. J. E. McConkie. (*Canner*, 1930, No. 5, p. 21.)

86. Frozen Pack Fruits. J. W. Sale. (*Ibid.*, No. 4, p. 15.)

87. The Composition of Grapes. G. Pitman. (*Fruit Prods. J.*, January, 1930, p. 147.)

88. The Formation of Pectin Jellies by Sugar. G. Spencer. (*Jour. Physical Chem.*, December, 1929, p. 1987.)

89. Preparation and Properties of Vitamin C fractions from Lemon Juice. H. L. Sipple and C. G. King. (*Jour. Am. Chem. Soc.*, January, 1930, p. 420.)

Cereal Products

90. Action of Aldehydes on Wheaten Bread. L. Karácsonyi. (*Z. Unters. Lebensm.*, 1929, 58, p. 517.)

91. Nature and Identity of Wheat Glutenin. M. J. Blish and R. M. Sandstedt. (*J. Biol. Chem.*, 1929, 85, p. 195.)

92. Detection of Artificially Bleached Flours. G. Joergensen. (*Ann. Falsif.*, 1929, 22, p. 471.)

93. Resistance of Nickel and Monel Metal to Corrosion by Milk. R. J. McKay, B. Fraser, and H. E. Searle. (*Am. Min. Met.* Eng. Tech. Pub., 1929, No. 192.)

Dairy Products

94. Determination of Nitrates and Nitrites in Whey. E. Ohlsson and H. Fredholm. (*J. Assoc. Off. Agric. Chem.*, 1929, 12, p. 429.)

95. Report on Eggs and Egg Products. J. C. Palmer. (*Ibid.*, p. 343.)

96. Bacteriological Control of Bottled Milk Pasteurised by the Holding Method. K. J. Demeter. (*Milch. Zeutr.*, 1929, 58, p. 367.)

97. Potassium Nitrate in Canadian Cheese. F. C. Harrison. (*Canad. J. Res.*, 1929, I., p. 256.)

98. Paper Bottles for Milk and Cream. G. Rice. (*Modern Packaging*, January, 1930, p. 46.)

Analysis

99. The Estimation of Fully-Saturated Glycerides as an Aid in the Analysis of Fats. B. C. Christian and T. P. Hilditch. (*Analyst*, February, 1930, p. 75.)

100. First Report of the Sub-Committee on the Determination of Arsenic, Lead, and other Poisonous Metals in Food Colouring Materials to the Standing Committee on the Uniformity of Analytical Methods.—I. Determination of Arsenic. (*Ibid.*, p. 102.)

101. Sixth Report of the Essential Oil Sub-Committee to the Standing Committee on Uniformity of Analytical Methods. The Determination of Citral in Lemon Oil. (*Ibid.*, p. 109.)

102. Report of the Milk Products Sub-Committee to the Standing Committee on Uniformity of Analytical Methods. The Determination of Sucrose in Sweetened Condensed Milk. (*Ibid.*, p. 111.)

103. Egg-yolk Margarine. E. Vollhase, H. J. Steinbeck, and E. Danielsen (*Z. Unters. Lebensm.*, 1929, 58, p. 342.)

104. Setting-Point Curve of Cocoa Butter. J. Staub and R. N. Malotaux. (*Chem. Weekblad*, 1929, 26, p. 596.)

105. Composition of Philippine Coffee. A Valenzuela. (*Phil. J. Sci.*, 1929, 40, p. 349.)

Various

106. Use of Active Charcoal for the Adsorption of Caffeine, particularly from Coffee Infusions. F. Sartorius and W. Ottemeyer. (*Z. Unters. Lebensm.*, 1929, 58, p. 353.)

107. Marbling and Corrosion of the Interior of Preserve Tins. W. D. Bogatsky, W. A. Biber, and L. G. Kischinewskaja. (*Z. Unters. Lebesm.*, 1929, 58, p. 506.)

108. Carbon Dioxide Preservation of Meat and Fish. D. H. Killeffer. (*Ind. and Eng. Chem.*, February, 1930, p. 140.)

109. Physics of the Ice Cream Mix.—I. Relationship between Basic Viscosity and Whipping Capacity of Ice-Cream Mixes. A Leighton and O. E. Williams. (*J. Physical Chem.*, 1929, 33, p. 1481.)

110. Basic Viscosity and Plasticity of Ice-Cream Mixes. A. Leighton and F. E. Kurtz. (*J. Physical Chem.*, 1929, 33, p. 1485.)

111. Viscosity-Plasticity Measurements of the Effect of Gelatin on Ice-Cream Mixes. F. E. Kurtz. (*J. Physical Chem.*, 1929, 33, p. 1489.)

112. Processing of Crab Meat. P. R. Nelson. (*Glass Container*, December, 1929, p. 10.)

113. The Mayonnaise Industry. R. S. Hollingshead. (*Canning Age*, February, 1930, p. 127.)

114. Planning a Cannery. O. H. Barnhill. (*Ibid.*, p. 107.)

115. The Lighting of Canneries. W. F. Mattes. (*Ibid.*, p. 110.)

116. Methods of Extraction Employed in Manufacture of Vanilla Extract. E. J. Kessler. (*Glass Packer*, January, 1930, p. 24.)

117. The Distribution and Nature of Food Poisoning. J. Cruickshank. (*Brit. Food J.*, February, 1930, p. 13.)

118. Contributions to the Knowledge of Cocoa Butter. H. P. Kaufmann. (*Zeit. ang. Chem.*, December 21, 1929, p. 1154.)

119. The Valuation of Ceylon Citronella Oil. (*Perfumery and Essential Oil Rec.*, December, 1929, p. 475.)

120. Beitrag zur Frage der Unschädlichkeit von Aluminiumgeschirr. C. Massatsch. (*Deut. Nahrungsmittel-Rundschau*, December, 1929, No. 26, p. 204.)

121. Evolution of the Chocolate Coater. F. de Marland. (*Manuf. Conf.*, January, 1930, p. 40.)

122. Illipé Butter as a Cocoa Butter Substitute. E. Benyon. (*Ibid.*, p. 45.)

Books Reviewed

Breadmaking: Its Principles and Practice. By E. B. Bennion, M.Sc., Tech.A.I.C. Oxford University Press, pp. 251. 15s.

The changes in the practice of breadmaking, especially towards more and more complete mechanisation of bakeries, necessitate a more thorough knowledge of the principles underlying the practice of this ancient trade, and Mr. Bennion's concise presentation of this wide field has not arrived too soon. The preface states that the book was written primarily for students, and to cover the syllabus of the City and Guilds of London Institute in breadmaking, and, therefore, it is in our opinion unfortunate that the price is so high. The printing is faultless, the paper expensive, and the production of the book of that high standard which one associates with the Oxford University Press, but students are not wealthy folk and cannot find all the knowledge they require in any one book, and, consequently, the book would have been more popular among students, we think, if the price was more suited to their pockets. The style in which the book is written shows it has been closely modelled on lecture notes, and only occasionally does the author depart from the condensed style and express his own opinions, which make more interesting reading.

The subject-matter is certainly well arranged, and the whole field of bakery matters is brought under review. Chapters II. and III. deal with the raw materials used in breadmaking, and of these flour is easily of prime importance to the baker. The next two chapters contain a very good and fair statement of the present situation regarding the bleaching and treatment of flour—practices which have evidently come to stay—and the baker needs to know as much about them as the miller. The subject of "Fermentation" might, with advantage, have been elaborated rather more than has been done in Chapter VI., and more detail, especially regarding yeast fermentation, would not have been out of place here, despite the return to it again later when considering the changes taking place in a sponge or dough. In this part of the book theoretical considerations, involving colloid chemistry and hydrogen-ion concentration, are subtly interwoven with the more practical, and, to the student, more interesting, details of breadmaking, so that "the powder is well covered with jam" and the reader is not repelled by an overdose of theory. Chapter X., for example, entitled "Changes taking Place in a Dough," is one of the best in the book, and an excellent summary of present-day knowledge of the several stages in the preparation of the food of the people. A few minor points might be challenged, such as the statement that half-sponges are more common in the country districts of England than in Scotland. Again, we would disagree with the statement on page 132 that tin bread should be baked in a cooler oven than cottage bread, commercial practice being always the reverse. Oven temperatures as indicated by oven thermometers vary enormously from one bakery to another, depending, for example, on the position of the thermometer in the oven, but, on the whole, the range of 450 degrees to 480 degrees is on the low side for full scale plant. The old question as to whether yeast does or does not reproduce in dough is referred to by the author on page 128, and we should have liked a rather clearer exposition of his views than he gives, for in one place he says: "In a dough . . . reproduction of yeast is doubtful," and five lines below: "Yeast is not able to work without reproducing, so that while density of the medium may affect the rate of reproduction, some reproduction certainly does take place." The section on "Rope" in bread admirably sums up the cause and cure of this annoying disease of bread, and should be learnt by heart by all bakery students to their everlasting comfort.

The chapters on fuels, and the well-illustrated chapters on ovens and machinery, could hardly be bettered, so much has been said and said well. The last two chapters on "Ventilation, Humidity Control, and Sanitation," and on "The Dietetic Value of Bread," are subjects with which the enterprising baker must be acquainted if he is to impress his customers with the value of his goods and the care and cleanliness which is exercised in their manufacture. It is well for manufacturers of foodstuffs to tell their customers these things.

An appendix concerned with the testing of flour, yeast, and malt, and a bibliography conclude the book, which will be a welcome addition to the small number of textbooks dealing with breadmaking.

Dairy Bacteriology. By B. W. Hammer. Chapman and Hall, 1928.

Professor Hammer has wisely not attempted to combine in one volume a general textbook of bacteriology and a manual for dairy workers. His *Dairy Bacteriology* assumes a sound elementary knowledge of general bacteriology, with the result that he has been able to devote the whole of some 450 pages to the study of micro-organisms in milk and milk products.

The author has treated his subject from the aspect of the effects of micro-organisms on milk and its derivatives, rather than from that of the micro-organisms themselves. Students of public health and the commercial side of dairy practice will read the book with interest; much space is devoted to the discussion of the milk-borne diseases and faults in dairy products.

Numerous tables and references are given, but the latter are drawn from a restricted field of workers. While the text consists largely of quotations from original papers, the author is not afraid to express his own opinion on some highly controversial questions.

The book is intended to supplement a course in practical work, hence no instructions or details for practical investigation are given. The work is a descriptive textbook rather than a student's handbook.

Food Value in Practice. E. M. Dobbs. University of London Press. 1929. xvi + 240 pp. Price 4s.

This is an admirably written book, giving guidance in diet planning and cooking in general. One must search far for a more comprehensive study of food values and the relation of food constituents to the public health. Methods of cooking are dealt with in detail, and much prominence is given to a broad treatment of the values of various foods from the technical standpoint. The author has made a very valuable practical classification of foods relative to the human system and the point of view of digestibility. The ideal household budget and diet sheet are discussed, together with a lengthy examination of the marketing, transport, and the various methods of food storage. A highly serviceable section of the book is the one dealing with the food question and diet in general in its relation to the health of invalids and aged people.

Cocoa and Chocolate Manufacture. H. W. Bywaters, D.Sc., Ph.D. London: J. and A. Churchill. 21s. net.

The author of this volume is well qualified to write on the subject of cocoa and chocolate, having been for many years chief chemist to Messrs. J. S. Fry and Sons, Ltd., cocoa and chocolate manufacturers, Bristol, and now a director of Messrs. Slade and Bullock, Ltd., Dewsbury. This volume is a technical treatise on the subject and is a valuable contribution to the literature, the subject-matter being dealt with in a thoroughly practical manner. *Cocoa and Chocolate Manufacture* bears the hallmark of having been written by one who has had a long and intimate experience of the industry. The author has succeeded in compressing into a small compass an unusually large amount of technical data. Scattered throughout the book are many items of information not to be found in existing textbooks concerning the modern technical aspects of cocoa and chocolate manufacturing operations.

The volume includes a detailed account of modern manufacturing methods, together with the résumé of the progress of the industry from the technical and mechanical standpoints during the last thirty years. The book is divided into sections dealing with (i.) raw materials, (ii.) cocoa manufacture, (iii.) chocolate manufacture, and (iv.) miscellaneous methods of manufacture and preparation. A well-developed account is given of the preparation of the cocoa beans, their commercial sources, transport, treatment, storage, and details of chemical tests applied to the products. An interesting illustrated description is given of the types of machinery introduced into the cocoa and chocolate industry during the last few years.

The Microscope in the Mill. By James Scott. The Northern Publishing Co., Ltd., pp. 246. 15s. 6d.

Among the books (published in recent years), which treat of technical subjects in a way which appeals to the non-technical reader, this work of Mr. Scott's is worthy of notice.

It deals with the formation, chemistry, and pests of corn, meal, and flour. The first half is concerned with the micro-characters of the starches, the important cereals, and the proteids of flour. In the remaining part, which mainly treats of the harmful fungi and insect pests, a perhaps somewhat disproportionate amount of attention is given to ergot, but the author has had special experience in this branch of the subject. The final chapter deals with the problem of the spontaneous combustion of corn, and though the views expressed must be described as rather speculative, they are none the less valuable as suggestions in a field of knowledge largely unexplored.

With regard to the chemistry there are a few statements which are somewhat loose and misleading, but this is perhaps difficult to avoid in a book which aims at interesting the popular reader. It is, however, surprising to find (on page 103) the statement that "Some chemists call tyrosin hydroxyphenyl-amido-propionic acid. I need not make any comment thereon." The first sentence simply means nothing more than that the "some chemists" remind themselves of the chemical nature of tyrosin, and to suggest that there is something pedantic in doing so, is to help perpetuate a popular confusion. Curiously enough, on the previous page, we are told that serin is amido-lactic acid!

On page 170 there is a misprint (benzine instead of benzene).

The microscopic side of the subject is ably dealt with, and the considerable number of clear diagrams, which are the author's own, is another excellent feature.

Reminders for Company Secretaries. Herbert W. Jordan. 15th ed. 66 pp. 1930. 2s. 6d.

The coming into operation on November 1, 1929, of The Companies Act, 1920, has necessitated the rewriting of the bulk of the book and its size has been increased by 50 per cent. The new Act is an elaborate measure consisting of 385 Sections and 12 Schedules, and additional obligations are imposed on every one of the 115,000 companies now in existence, whether it be either a public or private company limited by shares, or a company limited by guarantee, or an unlimited company. Probably no other Act deals with so large a number of offences or imposes so many penalties for contravention of its provisions. Four offences render offenders liable to a fine of £500, 47 to fines aggregating £5,357, and a further 47 to fines aggregating £586 for every day during which the defaults or contraventions continue. The duties of a secretary are increased and the holder of the office will in future be liable equally with his directors for penalties in respect of almost all defaults under the Act, relief in respect of former liability to penalty being afforded in but one instance—namely, where there is neglect in holding the annual meeting. Secretaries may find some consolation for their more onerous liability in the reflection that the responsible nature of their office is now fully recognised by the legislature.